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Has the Value of Gold Depreciated?

Recently Commodity Prices Have Risen with Increasing Gold Production but Such Coincidence Has Been Exceptional Rather Than the Rule

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The question forming the title of this article ought to be elaborated so as to read, "Has the value of gold depreciated because of cheaper production of gold?" No one can deny that the value of gold periodically appreciates and depreciates. We talk about gold as the standard of value, but the fixity of the value of an ounce of gold at $20.67 is arbitrary, resulting from the dictum of Congress in 1792 that 270 grains of gold, 0.916 2/3 fine (equal to 247.5 grains of pure gold), shall be stamped $10, which itself is based upon an old English act that 123.275 grains of gold, 0.916 2/3 fine (113 grains of fine gold), shall be stamped £1. However, the real value of gold is what it will buy and that is constantly fluctuating, but inasmuch as there must be something as the standard, gold is so adopted, and the prices for commodities are said to fluctuate with reference to gold, rather than the reverse.

The great rise in the value of commodities, which began about 1896 and culminated in 1907, naturally excited the attention of producers, manufacturers and consumers, and equally that of the bankers who regulate industrial developments and economists who study them. The paramount question pertained to the cause of this extraordinary rise. A remarkable increase in the production of gold occurring contemporaneously, it was easiest to explain by *post hoc ergo propter hoc* arguments, that the rise in commodity prices was due to the increased production of gold, meaning that the value of gold as compared with commodities had decreased.

The Prevailing Explanation

This explanation has been offered and elaborated by many economists, exemplified by Prof. J. Pease Norton, of Yale University, whose remarks in an article on "The Gold Situation and the Currency Outlook" in the *Review of Reviews*, for January, 1908, illustrate the view of this school. He said, "Although gold is the measure of the prices of all commodities

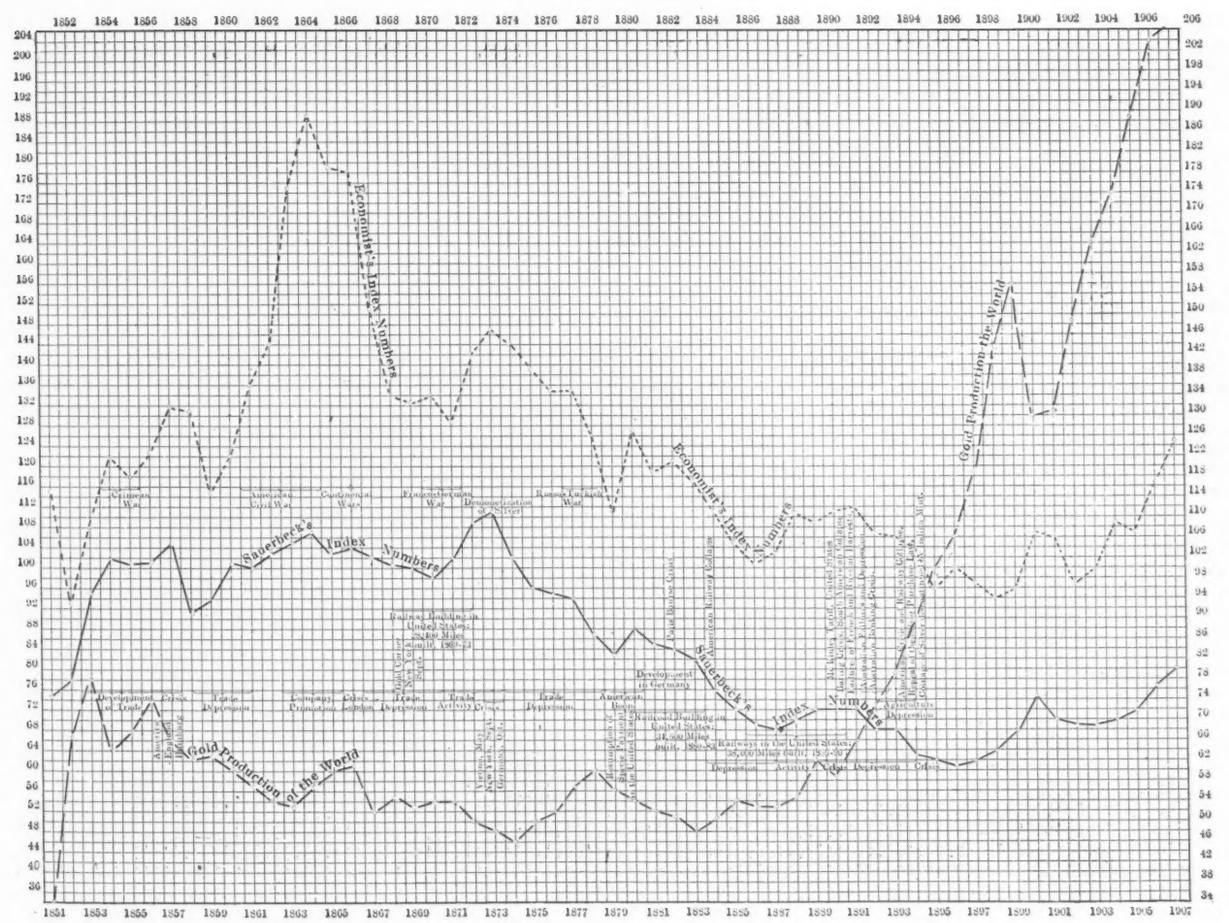


DIAGRAM I. GOLD PRODUCTION AND COMMODITY PRICES

as a standard of value, prices may increase because of a cheapening of the standard relative to commodities, or because of an increase in the value of commodities relative to the standard. In the one case, inventions in gold mining and new discoveries of gold would be active. In the second case, above mentioned, short crops, deficient economic progress and great pressure of population on the means of subsistence would be the effective causes for the high prices." Professor Norton wants to have an international "gold commission" to collect the statistical data necessary for recommendations as to what shall be done to correct the evil effects of the depreciation of gold as to which he is convinced.

It is surprising to discover how generally this idea is held. Professors of political economy, like Doctor Norton; captains of industry, like Andrew Carnegie; and eminent bankers are alike under the sway of this theory which is permeating a wide range of thought. In almost any broker's office the customer will hear that in the long run the prices for stocks are bound to rise, because they represent the capacity to produce commodities, and "the effect of the enormous production of gold is to cause prices to advance generally; not merely commodity prices, but also stock prices."

Cairnes' Analysis

This idea is by no means a new one. In the '50s, when California and Australia were pouring a new wealth of gold into the coffers of the world, there was a common fear that the supply would be increased so largely that the value would be diminished. Indeed, the output of the metal became so large that its purchasing power declined from 9 to 15 per cent., according to Jevons, and induced Holland to adopt the single silver standard, and some other countries to adopt bimetallism. John Stuart Mill is authority for the statement that if the money in circulation in the world be doubled prices will be doubled also, and it is an old and plausible argument that increase in gold production must necessarily increase the prices for commodities. Prof. J. E. Cairnes, of London, in 1859 undertook an inquiry as to how increase in gold production might influence the markets of the world. He pointed out that the wages of labor in the gold-producing countries rose to such hights, on account of the enormous profits, as to divert labor from other industries, necessarily ending in raising the prices of their outputs; the sudden wealth of the successful miners, spent profusely for necessaries and luxuries, created fresh demands for commodities and thereby elevated prices; finally, the addition of the new gold to the banking reserves of the world enabled banks to give largely extended credits and thus facilitate expansion of trade and industry.

Professor Cairnes' conclusions were based upon a sound study of the evidence existing at his time, but in his time gold mining as an industry was scarcely 10 years old, and we know now that (1) a great increase in gold production may occur without increasing wages and without attracting any large number of men away from previous occupations; (2) the profit derived from the production of gold is rarely expended at the place of production, but is distributed among many investors in the commercial countries of the world; and (3) much of what is considered to be profit is really not so, a subject to which I shall revert farther on.

Increasing Supply of Gold Means Increasing Demand for Commodities

The only way in which an increasing supply of gold can affect the prices of commodities is by increasing the demand for them. The new gold is partly expended by the producer himself, and partly invested by the stockholder who receives it in the form of a dividend. The part invested is expended for commodities by somebody else. If deposited in a bank, by the person who borrows it from the bank; if invested in a bond, by the seller thereof. In the words of Horace White, "There is no stopping place between the new gold and the commodities—food, clothing and other necessaries and luxuries—unless the gold is hoarded. In the latter case it has no more effect on prices than it had before it was taken out of the ground. In short, gold is itself demand for goods, new gold is new demand, an increasing supply of it is an increasing demand, and this causes a rise of prices, other things being equal.

So much for the theory. An increase in the production of gold will cause an increase in the prices for commodities, other things being equal. But as a mat- of fact, other things do not remain equal. Population and the production of the necessaries of life may increase in the same ratio as the production of gold, so that the latter merely supplies the increased requirement for it, and under that condition will not influence prices one way or the other. Industrial changes in processes of manufacture, means of transportation, and many other conditions may affect prices so that the average of the latter will go down, while the production of gold goes up, or *vice versa*. The crises of 1873 and 1890 were each followed by several years of severe commercial depression, but in each case, while prices were falling the production of gold was increasing, showing that gold of itself may not create sufficient demand to maintain prices. In this connection it is important to study the experience of the world from the time when records first became available.

Statistics of Gold Production

Statistics of the world's production of gold, year by year, have been compiled as far back as 1851. In the early part of this period the statistics were not of contemporaneous compilation by reliable authorities, but are largely the result of the restrospective investigations of later statisticians. For this reason there are discrepancies among the reports of various statisticians, which gradually disappear as the work of collecting the statistics of the gold production of the world was undertaken annually by reliable authorities such as the director of the United States Mint and "The Mineral Industry." In Table I are given statistics

I. GOLD PRODUCTION OF THE WORLD, 1851–1907.

Year.	Value.	Year.	Value.
1851	$ 67,600,000	1881	$103,102,000
1852	132,800,000	1882	102,000,000
1853	155,500,000	1883	95,400,000
1854	127,500,000	1884	101,700,000
1855	135,100,000	1885	108,400,000
1856	147,600,000	1886	106,000,000
1857	133,300,000	1887	105,775,000
1858	124,700,000	1888	110,197,000
1859	124,900,000	1889	123,489,000
1860	119,300,000	1890	118,848,700
1861	113,800,000	1891	130,650,000
1862	107,800,000	1892	146,292,600
1863	107,000,000	1893	158,437,551
1864	113,000,000	1894	182,509,283
1865	120,200,000	1895	198,995,741
1866	121,000,000	1896	211,242,081
1867	104,000,000	1897	237,833,984
1868	109,700,000	1898	287,327,833
1869	106,200,000	1899	311,505,947
1870	106,900,000	1900	258,829,703
1871	107,000,000	1901	260,877,429
1872	99,600,000	1902	298,812,493
1873	96,200,000	1903	329,475,401
1874	90,800,000	1904	349,088,293
1875	97,500,000	1905	378,411,754
1876	103,700,000	1906	405,060,969
1877	114,000,000	1907	412,556,136
1878	119,000,000	....	.....
1879	109,000,000	....	.....
1880	106,600,000	....	.....

of the world's annual production of gold beginning with 1851. The figures for 1851 to 1891, both inclusive, are from the report of the director of the United States Mint; those for subsequent years are as reported by "The Mineral Industry." A different set of figures for 1851-1872 is given in a British Parliamentary report for 1876, based on the figures of Tooke, Newmarch, and the London *Economist*. They are shown in Table II.

II. GOLD PRODUCTION OF THE WORLD, 1851–1872.

Year.	Adopted by U. S. Mint.	Parliamentary Report.
1851	$ 67,600,000	$ 67,600,000
1852	132,800,000	135,150,000
1853	155,500,000	140,400,000
1854	127,500,000	141,400,000
1855	135,100,000	151,200,000
1856	147,600,000	161,250,000
1857	133,300,000	138,225,000
1858	124,700,000	122,055,000
1859	124,900,000	107,290,000
1860	119,300,000	93,415,000
1861	113,800,000	112,270,000
1862	107,800,000	110,590,000
1863	107,000,000	100,575,000
1864	113,000,000	94,980,000
1865	120,200,000	101,270,000
1866	121,000,000	108,600,000
1867	104,000,000	103,500,000
1868	109,700,000	97,570,000
1869	106,200,000	106,415,000
1870	106,900,000	92,250,000
1871	107,000,000	108,965,000
1872	99,600,000	87,845,000

Index Numbers of Commodity Prices

The average prices for commodities are represented by index numbers computed by several authorities, of which the best

known are those of the London *Economist* and Augustus Sauerbeck. The statistics of both these authorities antedate 1851. Unfortunately, however, the statistics of the *Economist* at present available are only for certain dates of each year, those commonly quoted being of Jan. 1. Annual averages of the *Economist* figures have not been computed, but I understand that a complete survey of its index numbers, which will show the averages, is now in progress. In the diagram which accompanies this article, I have plotted the *Economist* index numbers of Jan. 1 of each year in order to furnish a comparison with the Sauerbeck index numbers, but obviously the more value is to be placed upon the latter, which represent the average for each year.

During the last 20 years there have been additions to the publishers of index numbers, the best known of these being Dun's, Bradstreet's, and the Bureau of Labor, of the U. S. Department of Commerce and Labor. The figures of all of these authorities have been plotted insofar as they are available, but inasmuch as they show the same general trend of prices, it appeared to be unnecessary to prepare an engraving of this comparative diagram.

The *Economist's* and Sauerbeck's index numbers, together with the world's production of gold, in dollars, have been plotted in Diagram I. It will be understood, of course, that the appearance of these curves may be altered by changes in the scale of the abscissas and ordinates, although their general relationship will be the same. In order to bring the three curves upon the same plate, the *Economist* index numbers were divided by 20, while the world's production of gold is plotted in units of $2,000,000. The Sauerbeck index numbers are plotted normally.

I am aware that comparison between gold production and the index numbers have previously been made by economists, of whom some are inclined to put but little weight upon it, because of (1) inaccuracies in the index numbers, (2) the chance that they may differ from "weighted" averages, and (3) the well known fact that the status of credit may entirely offset the effect of gold production. I hope to forestall criticism on these grounds by pointing out that (1) the index numbers of various authorities agree fairly well, (2) in the cases of many important commodities as to which it has been possible to make the test the "quotational" average and the "weighted" average over a series of years have not been far apart, and (3) while it is true that the effect of gold production may be offset by the status of credit, it is upon the former alone that the advocates of the

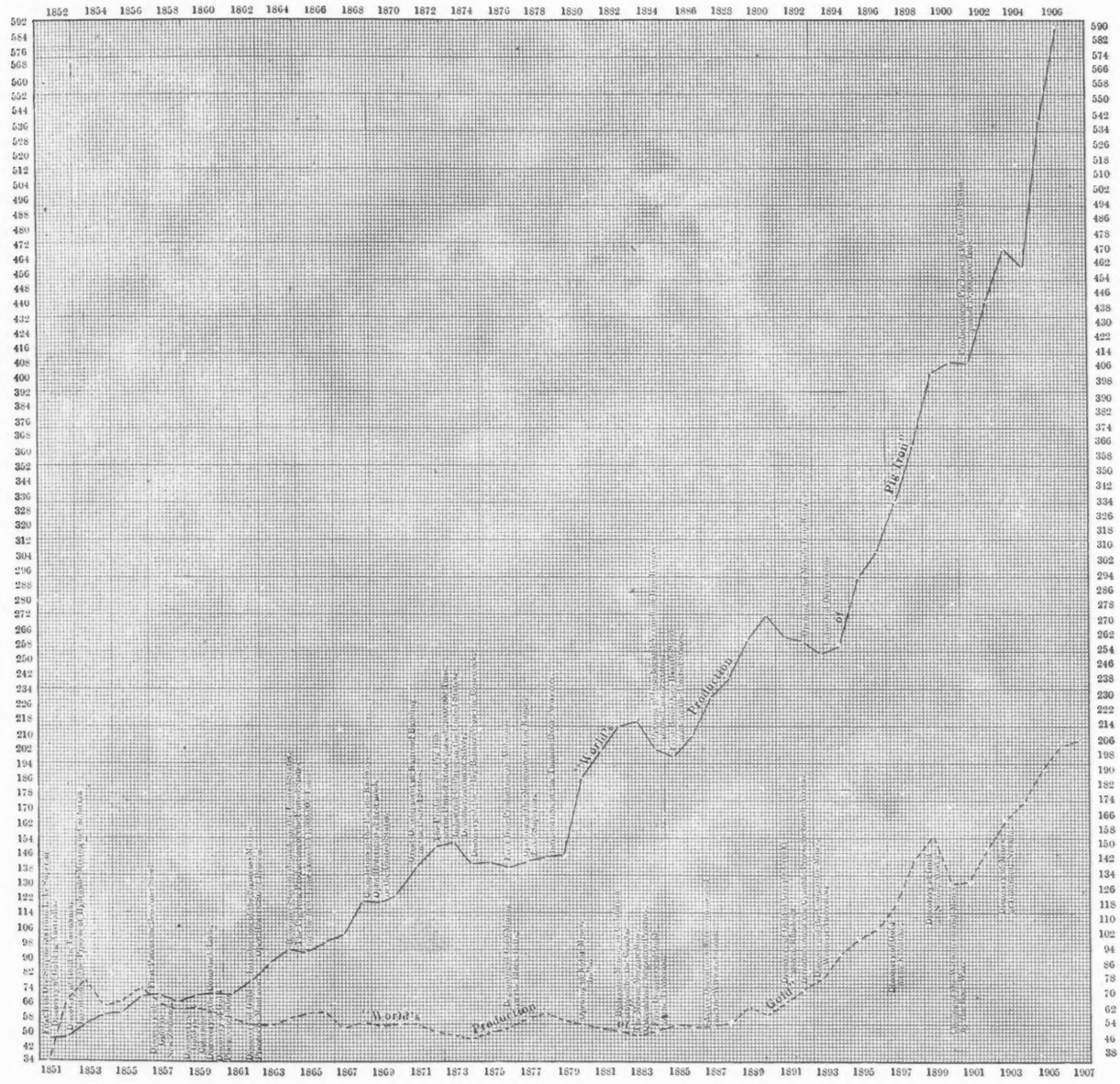


DIAGRAM II. PRODUCTION OF GOLD AND PIG IRON

depreciation theory hang their case. Consequently, I hold that a comparison between gold production and the index numbers affords a substantial test of the theory.

But Little Coincidence

Diagram I certainly does not show any constant coincidence between the production of gold and prices for commodities. On the contrary with a singular perversity, the courses of the two curves are to a large extent the opposite. From 1851 to 1859 there appears to be a parallelism, if we disregard the depression in gold production in the middle of the period, which may be due to statistical errors, the statistics for the early times being more or less subject to doubt as previously explained. The statistics of gold production in the British Parliamentary report do not show this depression. In fact there is considerable variation between the Parliamentary statistics and those adopted by the U. S. Mint between 1859 and 1873, although the divergences of the Parliamentary statistics are not sufficient to throw doubt upon the showing of the other statistics which I have plotted. I am disposed to think that the Parliamentary statistics for 1851-56 are the more accurate, but less accurate for 1857-72, this opinion being based upon the appearance of the two curves.

After the crisis in 1857, the prices for commodities rose steadily until 1864, while the production of gold was going down. Prices then declined until 1870, while gold production was fluctuating between comparatively narrow limits. In 1871 prices started upward and rose until 1873, while gold production was declining. Prices then fell steadily until 1879, while gold production was increasing. After a slight rise of prices in 1880, the decline was resumed, and this time coincided with a declining gold production until 1883, when gold production began the rise which has continued with only slight interruptions ever since, while the decline in commodity prices kept on until 1896.

Thus it may be seen that from 1858 to 1896 the prices for commodities frequently went down as the production of gold increased, and *vice versa*. In 1896 began for the first time a steady and prolonged rise both in prices and gold production. However, it cannot be scientifically argued that a conclusion should be drawn from this period of 11 years, comparatively brief, to the disregard of the experience of 45 years that preceded it, especially in the light of the knowledge that since 1907 commodity prices have been coming down, while the production of gold is still going up. The outlook at present is for a small increase in the world's production of gold in 1908. It is to be remarked that a substantial part of the gold production is derived from copper, silver and lead ores, the output of which is governed by the prices for those metals. The situation in them has restricted gold production in 1908 to some extent.

III. INDEX NUMBERS OF COMMODITY PRICES.

Year.	Sauerbeck's.	Economist.
1851	75	2,293
1852	78	1,863
1853	95	2,167
1854	102	2,445
1855	101	2,357
1856	101	2,459
1857	105	2,645
1858	91	2,612
1859	94	2,304
1860	99	2,426
1861	98	2,727
1862	101	2,878
1863	103	3,492
1864	105	3,787
1865	101	3,575
1866	102	3,564
1867	100	3,024
1868	99	2,682
1869	98	2,666
1870	96	2,689
1871	100	2,590
1872	109	2,835
1873	111	2,947
1874	102	2,891
1875	96	2,778
1876	95	2,711
1877	94	2,715
1878	87	2,529
1879	83	2,225
1880	88	2,538
1881	85	2,376
1882	84	2,435
1883	82	2,342
1884	76	2,221
1885	72	2,098
1886	69	2,023
1887	68	2,059
1888	70	2,230
1889	72	2,187
1890	72	2,236
1891	72	2,240
1892	68	2,133
1893	68	2,121
1894	63	2,082
1895	62	1,923
1896	61	1,999
1897	62	1,950
1898	64	1,890
1899	68	1,918
1900	75	2,145
1901	70	2,126
1902	69	1,948
1903	69	2,003
1904	70	2,197
1905	72	2,136
1906	77	2,322
1907	80	2,499

IV. INDEX NUMBERS OF COMMODITY PRICES.

Year.	U. S.	Bradstreet's.
1890	112.9	
1891	111.7	
1892	106.1	7.777
1893	105.6	7.532
1894	96.1	6.685
1895	93.6	6.435
1896	90.4	5.912
1897	89.7	6.116
1898	93.4	6.571
1899	101.7	7.210
1900	110.5	7.884
1901	108.5	7.575
1902	112.9	7.876
1903	113.6	7.936
1904	113.0	7.919
1905	115.9	8.100
1906	122.5	8.418
1907	129.5	8.905

V. WORLD'S PRODUCTION OF PIG IRON.
(In Metric Tons.)

1851	4,584,232	1880	18,626,160
1852	4,688,156	1881	20,039,461
1853	5,315,672	1882	21,461,867
1854	5,708,490	1883	21,729,202
1855	5,969,757	1884	20,150,042
1856	6,909,605	1885	19,792,890
1857	7,051,760	1886	20,862,989
1858	6,582,517	1887	22,977,983
1859	6,981,216	1888	24,016,705
1860	7,291,521	1889	26,030,266
1861	7,179,754	1890	27,431,229
1862	7,782,631	1891	26,219,525
1863	8,726,547	1892	25,978,619
1864	9,368,260	1893	25,266,746
1865	9,351,073	1894	25,847,352
1866	9,782,142	1895	29,354,597
1867	10,224,013	1896	30,850,412
1868	11,996,325	1897	33,451,220
1869	11,889,312	1898	36,555,361
1870	12,302,372	1899	40,447,900
1871	13,874,315	1900	41,028,479
1872	14,861,974	1901	40,950,692
1873	15,170,115	1902	44,342,579
1874	13,994,179	1903	47,113,730
1875	14,140,081	1904	46,069,501
1876	13,807,343	1905	54,054,783
1877	14,073,446	1906	59,074,861
1878	14,352,605	1907	60,680,014
1879	14,473,964		

Note:—The statistics for 1851-1899 are compiled from data in Neumann's "Die Metalle;" those for subsequent years are from The Mineral Industry.

Gold and Pig Iron

Comparison between the statistics of gold production and commodity prices being so negative as to a relationship between the two, it appeared useful to consider what relation there has been between the production of gold and the world's requirement for it. The world's production of pig iron was selected as the best indication of the advance in the arts and general civilization, the status of the industrial countries of the world being well established by the amount of pig iron that they use. Pig iron is a substance for which reliable annual statistics are available as far back as 1851.

The world's production of gold and of pig iron is plotted in Diagram II. In this diagram the production of gold is plotted in units of $2,000,000. The production of pig iron is plotted in units of 100,000 tons. Inasmuch as the plotted unit of gold production is $2,000,000, and 100,000 tons of pig iron may be reckoned on the average as being worth approximately $2,000,000, the world's production of these two substances is represented substantially on terms of commercial equality, which consequently affords a reliable means for comparison.

A mere glance at these two curves discloses the striking story that they have to tell. The general tendency of each is to ascend, that of pig iron from the beginning and that of gold since 1883, but the production of pig iron has increased in much greater ratio than the production of gold. If I am correct in the assumption that the production of pig iron is a reliable barometer of the advance in commerce and industry, it is evident that the production of gold has not even kept pace with the commercial requirement of the world for it. If this deduction be sound, there has been no superfluity of gold to manifest itself by a rise in commodity prices, and such increase of the latter as has occurred since 1896 must have been due to other causes. It might even be argued that the production of pig iron, and inferentially the need for a medium of exchange in transacting business, has increased so much more rapidly than the production of gold, that the relative lag of the latter might have led to commercial disturbance, but we find the explanation for the normality of the curves in the knowledge that banking facilities and the means for transacting business have improved, so that we have been able progressively to get along with less and less gold relatively. This idea is emphasized if it moreover be inferred, for which unfortunately there is no statistical evidence, that the proportion of gold con-

sumed in the arts is constantly increasing, leaving less available for financial requirements.

It appears to me to be conclusive from the above statistical analysis that (1) during the last 60 years there has been but slight parallelism between the production of gold and the average of commodity prices; and (2) the production of gold has not increased so rapidly as the production of pig iron and inferentially less rapidly than the advance of the world in commerce and industry. Then let us see in what way the exponents of the theory of the depreciation of gold go astray.

Fallacies of the Depreciation Arguments

Professor Norton says that "the amount of cheap gold ore is unlimited in nature." This will be news to mining engineers, who spend much time and money in searching for new ore deposits that promise a profit. They will also be interested in learning from Professor Norton that "the ingenuity of chemists and metallurgists" has "succeeded in reducing the profitable working cost (*sic*) per ton of ore from $14 per ton to less than $2 per ton at the present time." The idea of the mining engineers is exemplified by a paper by F. Lynwood Garrison, read before the Franklin Institute, Nov. 20, 1907. He pointed out how gold-mining districts wax and wane and said: "The conclusion is therefore unavoidable that the world's gold production has not reached an abnormal or unhealthy proportion when compared with the enormously increased commercial activities of the times. On the contrary, if anything, we need more gold, for business seems to have outgrown the supply of circulating medium, that is, coined money or currency. Gold is certainly not cheaper, and as some of the chief present sources of supply are exhibiting indubitable signs of exhaustion, it is not likely to become so. It is, therefore, evident that if the present rate of increase is to be maintained we must soon call upon the comparatively undeveloped fields of Siberia, Central and South America, and perhaps parts of Africa, although the prospects for gold in the latter country are not encouraging."

Profit in Production as the Criterion

The economists who advance the argument that gold has been becoming cheaper to get would do well to dismiss the matter of working cost and fix their attention upon the formula

$$X = M - (o + d + p),$$

in which X is the net profit per ton of ore, M the value of the metal extractable from a ton of ore, o the direct operating cost, d the proportional cost of development work, and p the amount that must be charged off for amortization of plant and capital invested in all forms. It is quite true that working costs have been greatly reduced during the last 10 years, which has enabled the utilization of lower and lower grade of ore, but it is doubtful if the net profit per ton of ore has been increased. On the contrary, it probably has decreased. The great increase in gold production has come from the Witwatersrand, but its mines have not been so profitable as many think, if all things be considered. This subject is too complex to be taken up in a brief discussion, but it pertains to the question whether in spite of the large dividends paid by the Rand mines they are not failing to return the actual investment in them with a fair interest upon it.

Bonanzas Become More and More Rare

Any possible depreciation in the value of gold must arise from an increase in the ease of obtaining it. However, the experience has been that (1) rich placers are quickly exhausted, (2) the profit gradually diminishes as the poorer ground has to be worked, (3) the discovery of new placers becomes more and more infrequent, and (4) the proportion of gold obtained from placers as compared with lode mines steadily decreases. In the case of many of the remarkable lode-mining districts the history is similar. Cripple Creek and Kalgoorlie, for example, began with extraordinarily rich mines, but within a few years it became a matter of operating on a close margin; doubtless the history of Goldfield will be the same. The output of cheap gold from such sources has generally been, at any given time, small in comparison to the grand total, and never has lasted long.

The deprecation theory must stand upon two conditions, namely, (1) some regular relation between the amount of gold production and commodity prices, and (2) evidence that the cost of producing gold has diminished, while commodity prices have risen, or *vice versa*. These conditions are closely related, because it cannot be argued rationally that an increase in the production of gold depreciates its value, unless the gold be obtained at a reduced cost.

The failure to establish the first condition is shown by the comparison by the statistics of gold production with the index numbers representing the average prices of commodities, which is made in Diagram I. Equally destructive of the depreciation theory is the record of the Witwatersrand, the marvelous and rapidly increasing production of which is apparently the basis for the recrudescence of the theory.

The Record of the Rand

The Rand became productive in the '80s. In 1890 the gold production of the Transvaal was £1,869,645; in 1895 it was £8,569,555; in 1898 it was £16,240,630; and in 1906 it was £24,579,987, amounting in that year to nearly 30 per cent. of the world's total. While the production of the United States, Australasia, Russia, Mexico, Canada, and India during the last 10 years has been increasing but slowly, that of the Transvaal has risen by leaps and bounds. However, it does not follow from this that the Transvaal gold has become increasingly easier to obtain. Mining and metallurgical engineers know the contrary to be the case, and their opinions are supported by the statistics which for this district are singularly complete, so much so indeed that the mine managers complain of the burden of an "over-regulated, over-inspected, over-statisticated régime." What the statistics show as to the total production and total dividends appears in an accompanying table.

The total production in the five years 1890-1894 was £22,482,671, out of which dividends amounting to £3,951,211, or 17.5 per cent. were paid. In the five years 1895-1899 the production was £60,796,424, out of which dividends to the amount of £14,062,311 or 23.1 per cent. were paid. In the six years 1902-1907 the production was £108,683,521 and the dividends were £27,118,770 or 24.9 per cent. The percentages in 1900 and 1901 are not computed, these being the war years. It appears that the average dividends of the six years since the war have been about 25 per cent. against about 23 per cent. as the average of the five years just before the war. The average of 1890-1894, a period when the mining industry of the Transvaal was in its initial stage, was 17.5 per cent.

VI. PRODUCTION AND DIVIDENDS OF THE TRANSVALL GOLD MINES.

Year.	Production. £	Dividends. £	Per Cent.
1890	1,869,645	254,551	13½
1891	2,924,305	334,698	11½
1892	4,541,071	879,320	19½
1893	5,480,498	955,358	17½
1894	7,667,152	1,527,284	20
1895	8,569,555	2,046,852	24
1896	8,603,821	1,513,682	17½
1897	11,653,725	2,707,18	23
1898	16,240,630	4,848,23	30
1899	15,728,693	(a) 2,946,358	19
1900	1,510,131	(a)	
1901	1,096,051	(a) 415,813	
1902	7,253,665	(a) 2,121,126	29
1903	12,589,248	3,345,502	26½
1904	16,054,809	3,927,830	24
1905	20,802,074	4,857,539	23
1906	24,579,987	5,735,161	23½
1907	27,403,738	7,131,612	
1890–1894	22,482,671	3,951,211	17½
1895–1899	60,796,424	14,062,311	23.1
1902–1907	108,683,521	27,118,770	24.9

(a) War period, October 11, 1899 to May 31, 1902.

Such a record of dividends is instructive, but it must not be accepted as the last word in a case like this. Mining dividends are profit only in part; a large part is simply return of the principal invested. As to the amount of the latter, there is seldom any record. The increase in the dividends paid by the Rand has doubtless been to a large extent the result of the investment of great sums of money sent out from Great Britain and France, which have enabled the erection of mining and milling plants capable of operating on a vastly increased scale and at a materially reduced expense. Yet it does not follow that the apparent economy

and increase in earnings thus resulting is all profit. On the contrary, there are engineers who argue that the net yield of the Rand mines is on the whole no more than the money put into them would have returned if invested in 3 per cent. consols. While this may be true insofar as the rank and file of investors is concerned, it probably is not true with respect to the money actually invested in the mines, which is to say that the real profits have been anticipated (as is generally the case) by the promoters, but while some of the latter have realized large fortunes, after all their aggregate is small in comparison with the grand total of Rand production.

VII. WITWATERSRAND GOLD PRODUCTION.

(Chamber of Mines Returns.)

Year.	Tons Milled.	Value.	Value per Ton Milled.
		£	s.
1884-9...	1,000,000	2,440,000	48.8
1890 ...	730,350	1,735,491	47.4
1891 ...	1,154,144	2,556,328	44.2
1892 ...	1,979,354	4,297,610	43.4
1893 ...	2,203,704	5,187,206	47.0
1894 ...	2,830,885	6,963,100	49.2
1895 ...	3,456,575	7,840,770	45.2
1896 ...	4,011,697	7,864,341	39.2
1897 ...	5,325,355	10,583,616	39.74
1898 ...	7,331,446	15,141,376	41.3
1899 ...	6,872,750	15,067,473	43.84
1900 ...	459,018	1,510,131	65.82
1901 ...	412,006	1,014,687	49.25
1902 ...	3,416,813	7,179,074	42.00
1903 ...	6,105,016	12,146,307	39.79
1904 ...	8,058,295	15,539,219	38.46
1905 ...	11,160,422	19,991,658	35.82
1906 ...	13,571,554	23,615,400	34.80
1907 ...	15,523,229	26,421,837	34.04

During the recent history of mining on the Rand, the production of gold has been increased greatly through the opening of new mines and the prosecution of mining generally upon a larger and larger scale. The grade of the ore extracted has rather steadily diminished, as is shown in an accompanying table, and the effort of the mine managers has been to diminish the cost of production in a greater ratio. To some extent they have succeeded in that, but at what expense of capital, i.e., accumulated money drawn from investors in Great Britain, France and elsewhere, it is difficult to determine. Consequently, we cannot talk in terms of the ultimate analysis about the cost of producing gold on the Rand. But disregarding this important consideration, it cannot reasonably be argued that a profit of 25 per cent. of the production in the six years after the war against 23 per cent. in the five years just before the war, these periods coinciding with the great increase in the world's gold production that has alarmed certain economists, indicates any such reduction in the cost of obtaining gold as would depreciate the value of the latter so as to account for the great rise in commodity prices. It is worth while in this connection to repeat that the Rand is far and away the most important gold-mining district of the world, and its output represents approximately 30 per cent. of the world's total.

Conditions of Gold Production Have Changed Radically in 60 Years

The conditions of gold mining in the '50s long since ceased to exist, and the analysis of Professor Cairnes, brilliant and probably correct at that time, is obviously not applicable at present. Previous to the nearly contemporaneous discoveries of gold in California and Australia, the industry of gold mining and the world's production of gold were both insignificant according to modern standards. The statistics for the time previous to 1851 are too incomplete and unreliable to furnish a substantial basis for the study of the relations between gold production and commodity prices. Nevertheless, it is well established that prices were at certain times greatly affected by gold supplies. Thus, one of the chief causes of the decay of Spain after the reign of Ferdinand and Isabella is said to have been the extensive importation of gold and silver from the newly found Western Continent, with the prevailing theory that actual money was the only form of wealth. Prices of commodities in Spain were turned topsy-turvy by the vast influx of the precious metals. But I may point out that the precious metals then brought into Spain were the result of conquest, not of direct mining, and were obtained comparatively cheaply.

In the early days of mining in Australia and California, the magnets which attracted men from other industries were placer deposits, the working of which was mining in its elemental form, i.e., the digging of a valuable mineral with the expenditure of nothing but labor. The adventurers who were able to obtain gold from rich river bars with a pan or a long tom were willing to spend their produce profusely and extravagantly, and their cheaply gained gold created commercial disturbances. However, just as the ability to obtain gold by conquest on the Spanish Main disappeared, so also did the ease of obtaining gold from rich placers in Australia and California. Although the early history of those regions was repeated recently in the Klondike and at Nome, the life of their rich placers was brief (as is always the case) and their output was too small in comparison with the world's total at their time to be of any material effect.

From this study of statistics and economic conditions I draw the conclusion that during the last 50 years there has been no cheapening of an ounce of gold; that the production of gold has not increased in so great a ratio as the production of pig iron, and probably the advance of the world in commerce and industry; and that gold production and commodity prices have failed to follow similar courses.

During the commercial depression which began in 1907, the prices for commodities declined, but not to points so low as in 1893-97. The arrest of the decline was to a large extent due to the absence of any radical cut in the wages for labor. Confining attention to the metals, I believe that there were no conditions existing in 1907-08 which would have prevented pig iron, copper and lead from falling to points as low as in 1893-97, if the severity of the depression had compelled certain readjustments; in other words, the arrest of the decline was due to factors which could and would have been swept away if necessary. The ability of the copper-mining companies of Butte, Mont., promptly to reduce the cost of producing copper from 12c. to 10c. per lb. is sufficient evidence on this line.

Recent Rise in Prices Due to Other Conditions

If then the recent rise in commodity prices has not been due to the increasing gold production, the explanation must be sought in other directions. Undoubtedly, the causes have been complex. On the one hand we have remarkable improvements in industrial methods, tending to reduce the cost of production, and consequently prices. On the other hand we have exhaustion of certain natural resources, such as timber, tending to increase prices. Among the factors which undoubtedly have contributed to the increase in commodity prices during the last 10 years are the policy of labor unionism and the increasing inefficiency of labor; the industrial consolidations, accumulation of great fortunes through anticipation of profits, and an inauguration of general extravagance in living; waste of resources and reckless expenditure of money in replacing them; over-extension in enterprise; failure of agricultural development to keep pace with the growth of population, thereby increasing the cost of food and clothing and directly leading to advance of wages for labor in manufacturing. The extent to which these and other factors have operated is an important subject of inquiry by the economists. Less has been heard of the theory that gold has depreciated in value since the commercial depression began in 1907, affording a decisive demonstration that prices still can fall as well as rise. It is scarcely to be doubted that the prices for commodities will continue to fluctuate in the future as they have in the past, independently of the world's production of gold, the effect of which upon prices at any time in the world's history has been but ephemeral and has been due to conditions that long since ceased to exist. The steady increase in the production of gold is in itself evidence that mining for it is now carried on as an industry, and as in the case of most industries at a small margin of profit on the whole; the gold supply is no longer swollen by the unearthing of buried treasure, by piratical or martial conquest, or by the discovery of placer bonanzas.

Iron Operations of the Birmingham District

Red Mountain Furnishes Bulk of Ore Produced; Raw Materials Found within Comparatively Small Area; Labor Conditions Not the Best

BY EDWIN HIGGINS

The Birmingham district ranks second in importance in the United States as a producer of iron ore, its output during 1907 having been in excess of 4,000,000 long tons, from which more than 1,500,000 tons of pig iron were made. The Lake Superior district, including parts of Michigan, Minnesota and Wisconsin, produced during 1907, in round figures, 42,000,000 tons of iron ore, or approximately 75 per cent. of the iron ore from which pig iron was made in the United States.

The iron ores of the Birmingham district may be conveniently discussed under the following heads: Clinton red hematites; brown ores, known as brown hematites; and Cambrian gray and red hematites of eastern Alabama. These ores are used in the manufacture of pig iron for foundries, pipe works and mills, and for making basic iron for open hearth steel plants. Usually they are too high in phosphorus to be used in the manufacture of bessemer steel. It may be said that the amount of ore smelted in the Birmingham district is equivalent to the amount mined, for the tonnage shipped out for smelting is about equal in amount to that received from outside districts. The geology and origin of these ores has been discussed by many eminent geologists, and it is not purposed in this article to give more than a brief description of the ores and an outline of their occurrence.

The Clinton Ores

The Clinton formation, in which the red ore occurs, in this district consists chiefly of sandstone, shales and beds of hematite. The unweathered beds of hematite are calcareous and range from a calcareous, richly ferruginous sandstone to a ferruginous, silicious limestone. A relatively large amount of either ferrous or ferric iron is distributed throughout all the sediments of the formation.

The Clinton red hematite, which comprises the bulk of the iron ore produced in the Birmingham district, is mined chiefly on Red mountain, from a point just south of Bessemer to northeast of Trussville. The operations cover a distance of about 30 miles. This ore is also mined along Little Wills valley from Attalla to the Georgia line. Red mountain has a northeasterly-southwesterly trend, and the strike of the ore follows the same general direction, dipping from 10 to 20 deg. in a southeasterly direction.

The ores are divided into three beds, the Ida, the Big Seam and the Irondale. On Red mountain the Big Seam presents from 7 to 15 ft. of minable ore. These red ores, which include both oolitic and fossil varieties, are divided into two classes, hard and soft ores. The soft ores, which are the result of leaching by meteoric waters, occur at and near the outcrop of the bed and for varying depths down to 400 ft. along the slope of the bed. The distinction between the hard and soft ore is based upon differences of chemical composition, rather than on differences of hardness, the soft ore having had its lime removed, while the hard ore, not having been subjected to the action of the meteoric waters, retains its lime.

The depth to which this leaching has been carried on depends largely upon the permeability of the strata inclosing the ore bed. The soft ores may be said to have the following composition: iron, 52 to 55 per cent.; silica, 10 to 15; alumina, 5 to 7; lime, none to 0.5; manganese, 0.2;

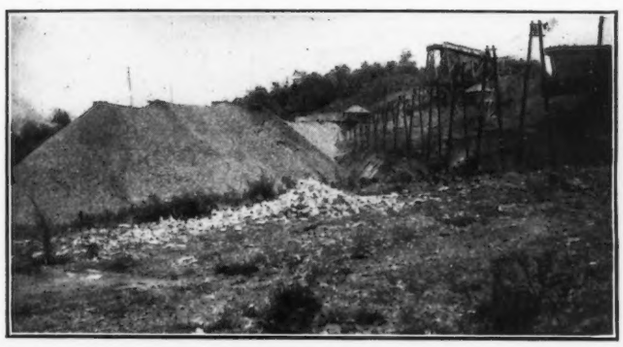


FIG. 1. 125,000-TON STOCK PILE AND TIPPLE, MUSCODA NO. 6, T.C.I. & R.R. CO.

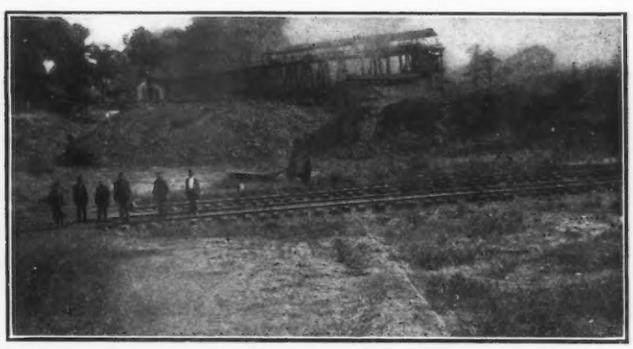


FIG. 2. NO. 1 TIPPLE, SLOSS-SHEFIELD STEEL AND IRON COMPANY

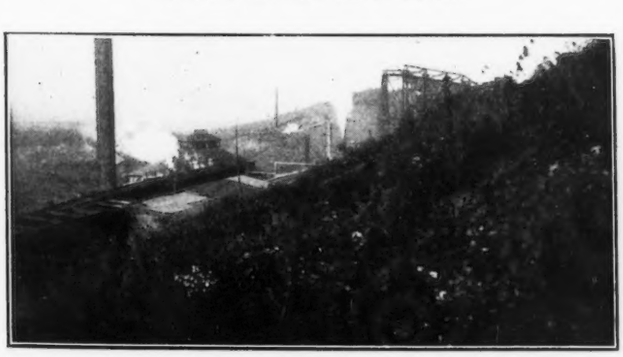


FIG. 3. ISHKOODA NO. 13 TIPPLE AND POWER PLANT, T.C.I. & R.R. CO.

FIG. 4. LOOKING NORTHEASTERLY FROM FOSSIL NO. 8 T.C.I. & R.R. CO. —COMPANY HOUSES IN DISTANCE

sulphur, 0.05; phosphorus, 0.1. Generally speaking, below the 500-ft. level, the ore will have about the following analysis: iron, 36 to 40 per cent.; silica, 6 to 8; alumina, 3 to 4; lime, 18 to 20; manganese, 0.2; sulphur, 0.07; phosphorus, 0.2 to 0.3.

The origin of the Clinton red ores is a subject on which there is room for much discussion. The theories of replacement, original deposition, residual enrichment, etc., all have their ardent supporters among our most able geologists.

Brown Hematites

The brown hematite ores lie between Red mountain on the southeast and west Red mountain and the Warrior coalfield on the northwest. The Woodstock district, 17 miles southwesterly from Bessemer, is the chief brown-ore district, with an area of about 38 square miles. The Russelville district, 105 miles northwest of Birmingham, in Franklin county, is an important brown-ore field. The Sloss-Sheffield is the only large company working in this district, having in operation five washers, and producing from 25,000 to 30,000 tons of ore monthly. Brown-ore deposits occur in Talladega, Clay, Calhoun and Cherokee counties. Two important operations are those of the Alabama Consolidated Coal and Iron Company, at Ironaton, Talladega county, and the Baker Hill mine of the Tecumseh Iron Company, in Cherokee county.

The brown hematites are distinguished from the red hematites by the fact that the former contain water, having the formula $2Fe_2O_3 + 3H_2O$, the red hematites having the formula Fe_2O_3. The brown hematites occur chiefly in the limestone and in the residual soil of the limestone, and near the contact of the limestone with other formations. The deposits are sometimes small and not to be depended upon. The brown hematites have the following range in composition: iron 42 to 48 per cent.; insoluble, 16 to 26; phosphorus, 0.4 to 0.8; manganese, 0.3 to 1.

Most writers on the subject hold that these brown hematites are secondary precipitations from waters carrying the iron in solution. A smaller number hold that the deposits are concentrations, or the oxidized remains of carbonates, the remnants of original limonite deposits, *in*

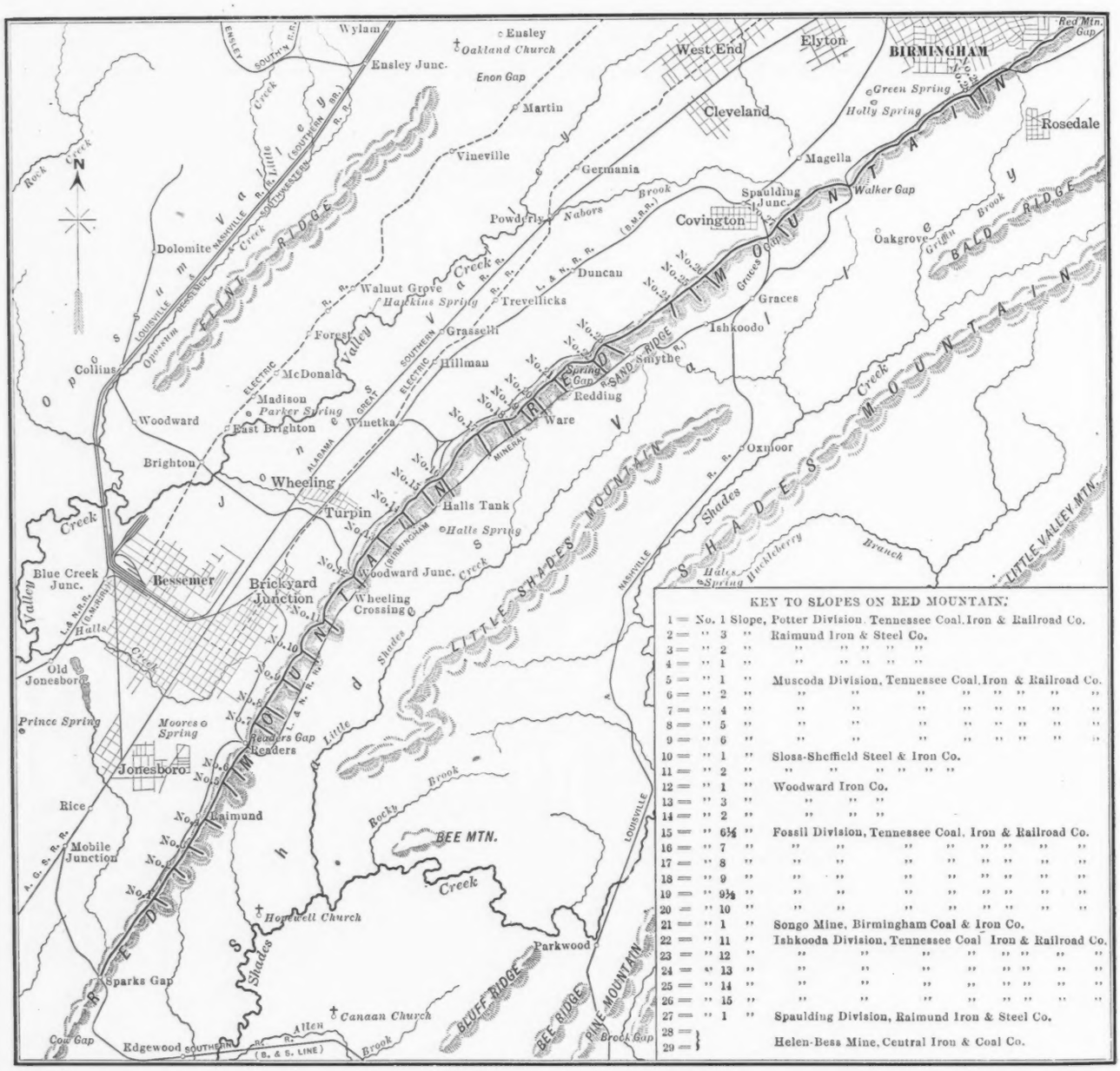


FIG. 5. MAP OF MOST PRODUCTIVE PART OF RED MOUNTAINS, SHOWING SLOPES AND COMPANIES OPERATING THEM

situ; while a still smaller number have suggested that the ores result from the oxidation *in situ* of pyrites, iron carbonates, or other ferriferous minerals.

Cambrian Gray and Red Hematites of Eastern Alabama

Dr. E. C. Eckel and Dr. J. S. Grasty have recently contributed interesting literature on this subject.

The gray hematites occur in various parts of northeastern Alabama, but have been developed only in Talladega county. The area developed comprises a narrow strip extending in a southwesterly direction from Talladega to a point near Sylacauga, a distance of about 20 miles. The ore is associated with a series of metamorphosed quartzites and marbles, and is probably of early Cambrian or pre-Cambrian age. Doctor Eckel holds the theory that the ores are replacement deposits; Doctor Grasty that these, as well as the Cambrian red hematites, are original sedimentary deposits which have been subjected to metamorphic action. The gray ores, according to Eckel, have the following range in composition: Iron, 45 to 53 per cent.; manganese, 0.5 to 1; sulphur, 0.007 to 0.4; phosphorus, 0.15 to 0.29; silica, 15 to 20; alumina, 2 to 4; lime, 0.2 to 1.5.

The red hematites are found near the town of Columbiana, in what is called the Columbiana district. In an air line this district is about 20 miles west of the gray-ore district. Here the geological conditions and the origin and composition of the ore are similar to those of the gray-ore district.

Although these red and gray ores are high in silica, they are of interest because

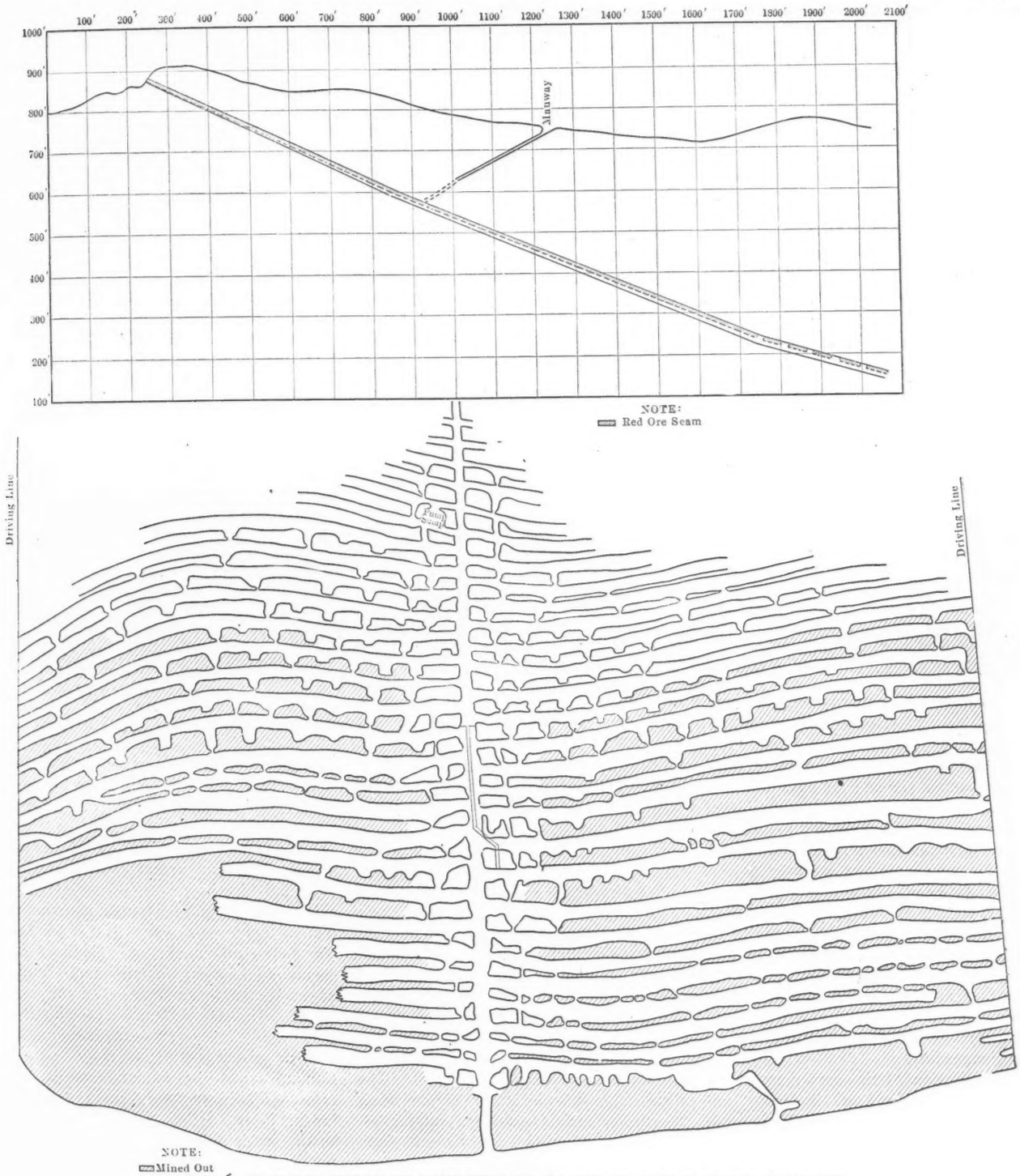


FIG. 6. PLAN AND SECTION OF SLOPE SHOWING METHOD OF MINING ON RED MOUNTAIN

of the possibility of mixing and successfully smelting them with the calcareous Clinton ores. In this connection it might be well to mention the experience of the Alabama Consolidated Coal and Iron Company with gray ores at the Gadsden and Ironaton furnaces. For a period of about two years this company used gray ore from the mines at Wewoka, about 10 miles southerly from Talladega. The ore used had the following range of composition: Iron, 36 to 39 per cent.; insoluble, 28 to 36; phosphorus, 0.25 to 0.33; manganese, a trace. This ore was easily smelted, but was lean and not altogether satisfactory. This instance is cited, not for the purpose of condemning the gray ore, but because it was the only working data which I was able to secure bearing on this subject. Further, I do not say that the analysis above is representative of the entire gray-ore district; nor do I know that ore could not be mined at Wewoka which would contain a much higher content of iron. The analyses given by Doctors Eckel and Grasty would indicate that it is possible to obtain ore, both from the red and gray hematite districts, which would show a much higher per cent. of iron. Needless to say, the successful utilization of these ores would add enormously to the reserves in this part of the State.

Mining on Red Mountain

That part of Red mountain which furnishes the bulk of the ore mined in the Birmingham district is shown in Fig. 5. The map shows the outcrop, the slopes sunk thereon, and the names of the operating companies.

A description of the operations of the Tennessee Coal, Iron and Railroad Company, the largest operator on Red mountain, will be of interest here. Fig. 6 shows a plan and section of a slope; from it may be obtained a fairly good idea of the method of mining. These slopes, which follow the ore bed, vary in dip from 15 to 25 degrees; they are made from 12 to 14 ft. in width and 9 ft. in hight. Headings are put in every 60 ft., and carried 15 ft. wide for a distance of 75 ft.; here manways are put up to the heading above. From this point to the driving lines of the slope the heading is carried 25 ft. wide; this leaves a pillar of 35 ft., which is robbed retreating. As the ore is broken, it is loaded into cars, five of which are hauled in a trip to the slope; here the ore is dumped into a skip. At the surface the ore is automatically dumped into the tipple pocket, or bin (see Fig. 8), from which it is fed to a crusher delivering about a 2-in. product. The crushed material goes direct to railroad cars. The tipple pockets vary in capacity from 50 to 500 tons. Each contractor has underground one drill helper and two muckers.

Sinking

In deepening the slope the following method is used: A pentice is built below the last working heading; on this is erected a tipple with a 42-in. gage track. A secondary hoist is installed and the rock is hoisted in a 2-ton car which dumps into a drop-bottom sinking skip of 6 tons capacity. When hoisting, the sinking skip is attached to the regular skip by a rope, a clearance of 6 ft. being left.

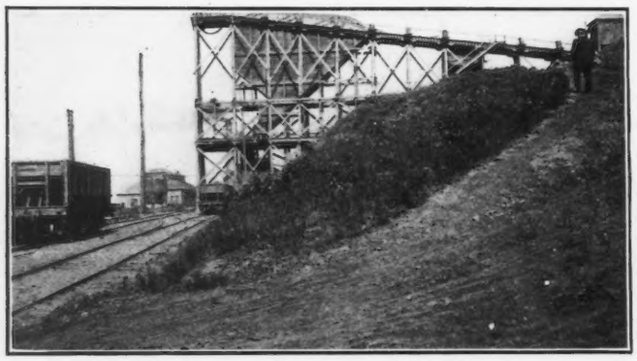


FIG. 7. MUSCODA NO. 5 TIPPLE, POWER HOUSE IN DISTANCE, T.C.I. & R.R. CO.

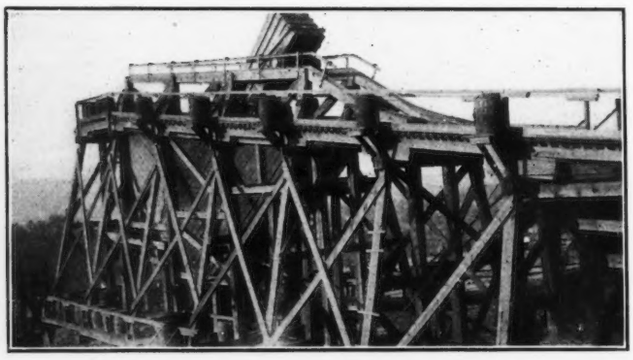


FIG. 8. SKIP DUMPING INTO BIN AT ONE OF T.C.I. & R.R. CO'S. TIPPLES

Description of Slopes

The company is operating 14 slopes and is preparing to open one more. These slopes are grouped into different divisions as follows: Potter division, one slope; Muscoda division, slopes 1, 2, 4, 5 and 6; Fossil division, slopes 6½, 7, 8, 9, 9½ and 10; Ishkooda divisions, slopes 11, 12, 13, 14 and 15.

At the Potter slope the workable ore has an average thickness of 7 ft. The slope is 422 ft. in length, its bottom being 200 ft. vertically beneath the surface. It is timbered down to a point 360 ft. from the collar.

In the Muscoda division the workable ore ranges from 9 to 11½ ft. in thickness. The slopes range from 1050 to 1741 ft. in length, or from 300 to 530 ft. vertical depth. The length of haul in the different slopes varies from 1000 to 1680 ft. In this division timbering is carried from 210 to 500 ft. down the slopes. In slope No. 1 there are 14 headings now driving; in No. 2, 5; in No. 4, 13; in No. 5, 17; in No. 6, 23. There are a total of six headings robbing.

In the Fossil division the thickness of workable ore ranges from 9 to 9 ft. 4 in. The lengths of the slopes vary from 1661 to 2034 ft., the vertical depth from 390 to 580 ft. The length of haul varies from 1420 to 1840 ft. The slopes are timbered for lengths varying from 410 to 1000 ft. from the surface. In No. 7 slope there are 17 headings now driving; in No. 8, 11; in No. 9, 20; in No. 10, 7. In this division there are a total of 25 headings robbing.

In the Ishkooda division the workable ore varies from 7 to 11½ ft. in thickness. Slope No. 12 is 1741 ft. in length, the vertical depth of the bottom being 240 ft. The length of haul is 1580 feet.

Tram cars are hauled by mules in all slopes. The amount of water pumped varies from a minimum of 6058 in Ishkooda No. 12, to a maximum of 832,809 gal. per 24 hours, in Muscoda No. 4, against a minimum head of 440 ft., and a maximum head of 480 ft., respectively. The loss of air pressure between compressor and pump is about 5 lb. at all slopes. The air pressure at pumps is 75 pounds.

In all these divisions it is noteworthy that in the deepest part of the slopes the ore shows no change in thickness or chemical composition from that found where the hard ore begins. In the Ishkooda division both benches of the Big Seam appear, showing a thickness of 20 ft.; the upper 11½ ft. is being mined. Coming down the mountain a parting comes in between the upper and lower bench. This is about ¾ in. in the Ishkooda, widening to about 1 ft. in the Fossil. Between Fossil No. 7 and Muskoda No. 6 the bottom bench splits into small seams interbedded with slate. The bottom bench is not of commercial value at any point on the mountain, there being too much silica in the ore.

The production of these mines is from 120,000 to 130,000 tons of ore per

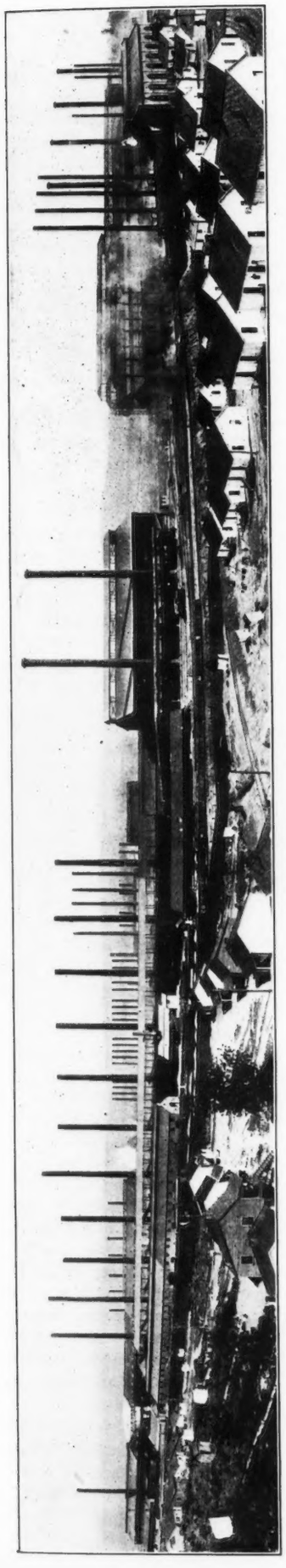


FIG. 9. REAR VIEW, PLANT OF TENNESSEE COAL, IRON AND RAILROAD COMPANY, ENSLEY, ALA.

month. At Muskoda No. 6 and Fossil Nos. 7 and 8 stock piles are carried. One of these stock piles is shown in Fig. 1. There are at present about 300,000 tons of ore in these stock piles. The mines work only one 10-hour shift per day.

The laborers in this district are mostly negroes. The wage scale is from $1.10 to $1.25 per day for surface work, $1.50 to $1.75 for muckers and $1.75 to $2 for drill hoppers. Most of the mining, however, is done on contract.

In the Muskoda division a new change house, with a capacity for 350 men, is being erected. This will have all modern improvements, including shower baths, steel lockers, etc. The building will be of brick.

Equipment

No. 3 Rand and type D-24 Ingersoll-Sargent drills are used underground. The headings are laid with 30-lb. rails, the gage being 42 in.; 70-lb. rails are used in the slope, the track being 5-ft. gage. Two-ton iron tram cars are used underground; the skip has a capacity of about 10 tons. The hoists are Nordberg twin-Corliss, 30x60, 778 h.p.; the drum is 12 ft. in diameter; 1¼-in. wire rope, 6-19, is used. The rope capacity is 7280 ft. The boilers are standard horizontal tubular, 72 in. by 18 ft., 150 h.p., steam pressure 125 lb. Boilers are squipped with the Murphy automatic stoker.

The latest type of compressor in use is the Allis-Chalmers horizontal, heavy duty, two-stage air, twin high-pressure engines, sizes: steam cylinders 26 in. x 48 in. stroke; air cylinders, 38 and 24. in. x 48. in. stroke. There will be installed at No. 7 slope a compound machine of the following size: steam cylinders, 26 and 48 in. x 48 in. stroke; air cylinders, 38 and 24 in. x 48 in. stroke. These machines have a capacity of 4000 cu.ft. of free air per min., at about 65 r.p.m. The standard pressure carried is 80 lb. per square inch. The crusher at the tipple is a standard No. 8 Austin, of 120 tons per hour capacity.

Prescott and Cameron station pumps are used in the mines. The regulation pump is a Prescott duplex 20x7½x18 plunger. In Muscoda No. 4 slope a new triple-expansion Prescott condensing pump has been installed. This has a capacity of 1000 gal. per min. against a head of 600 ft. This pump is operated by steam; all other pumps are operated by air.

Handling Brown Ores, Woodstock District

The following is the general method of handling the brown ores at the Greeley mine of the Tennessee Coal, Iron and Railroad Company, in the Woodstock district: The ore is mined with 60-ton steam shovels (2½-yd. dippers) and loaded into side-dump cars of 9 yd. capacity. These cars are hauled over a standard gage track to the washery where the ore is dumped into a mud box. Here the ore is washed with water from two 6-in. pipes. The mud boxes are set on a pitch of 22 deg.; they are 20 ft. long and 25 ft. wide at the upper end, narrowing down to 6 ft. at the lower end. The ore is fed from the mud box onto a grizzly spaced at 4 in. The overs from the grizzly go to a No. 8 Gates crusher which delivers its product to the log washers. The undersize from the grizzly goes through a flume set at an inclination of 22 deg., to a top screen with 2-in. holes. The overs from this screen go to a picking belt, thence to railroad cars. Unders from the top screen go to the log washers. All ore from the log washers is discharged into a cylindrical sand screen. The sand screens discharge direct to cars. The log washers are 30 ft. in length. There is one sand screen to two log washers and one picking belt for each screen. Crushing this brown ore removes a good deal of the included silica and alumina.

Coke and Limestone

The coking coal which supplies the Birmingham district is nearly all mined in Jefferson, Walker, Bibb, Tuscaloosa and St. Clair counties. The chief producers, with the situation of their operations, are as follows:

Republic Iron and Steel Company, Republic and Sayreton; Tennessee Coal, Iron and Railroad Company, Pratt mines, Adjer, Blue Creek, Johns, Sumpter and Blocton; Alabama Consolidated Coal and Iron Company, Searles, Brookwood and Lewisburg; Sloss-Sheffield Steel and Iron Company, Brookside, Blossburg and others; Woodstock Iron Works, Newcastle and others; Central Coal and Iron Company, Holt; Birmingham Iron Company, Blossburg, Murry, Adamsville, Short Creek and Mulga; Woodward Iron Company, near Woodward; Southern Steel Company, Altoona, Graves and Virginia City.

In addition to the above there are a few companies which do not make iron, but which make coke for the market. The average analysis of the coke produced is about as follows: Volatile, 3.5 per cent.; fixed carbon, 81.5; ash, 15; sulphur, 0.6 to 0.8. The average cost of coke made by companies owning their own plants is about $3 per ton; the average cost in the open market is $3.50 per ton.

The limestone is obtained throughout the district, except in the immediate vicinity of the coal mines. The quarries at Rock Springs, Etowah county, probably produce more stone than any other operation. Several furnaces procure their flux here, the cost being about 30c. per ton. This limestone runs high in $CaCo_3$, containing only from 1 to 2 per cent. silica and small amounts of iron and alumina oxides. A dolomite from near Birmingham gave the following analysis: Calcium carbonate, 55 per cent.; magnesium carbonate, 42; silica, 1.7; oxides of iron and alumina, 1.

FURNACE BURDEN AND QUALITY OF PIG

The Birmingham district is fortunate in having within its boundaries silicious and calcareous ore. It is often possible to so mix the ores that little or no limestone is required as flux. The accompanying table gives typical burdens in large and small furnaces making foundry iron, and furnaces making basic iron.

AVERAGE FURNACE BURDEN IN BIRMINGHAM DISTRICT.

LARGE FURNACES, MAKING FOUNDRY IRON.	
½ brown ore, ½ Clinton hard ore	16,000 lb.
Coke	10,600 "
Limestone	3,500 "
SMALL FURNACES, MAKING FOUNDRY IRON.	
½ brown ore, ½ Clinton hard ore	7,600 "
Coke	3,600 "
Limestone	3,600 "
FURNACES MAKING BASIC IRON.	
Ore*	18,000 "
Coke	10,500 "
Limestone	3,800 "

*Usually all Clinton hard ore, or hard and a small percentage of brown ore.

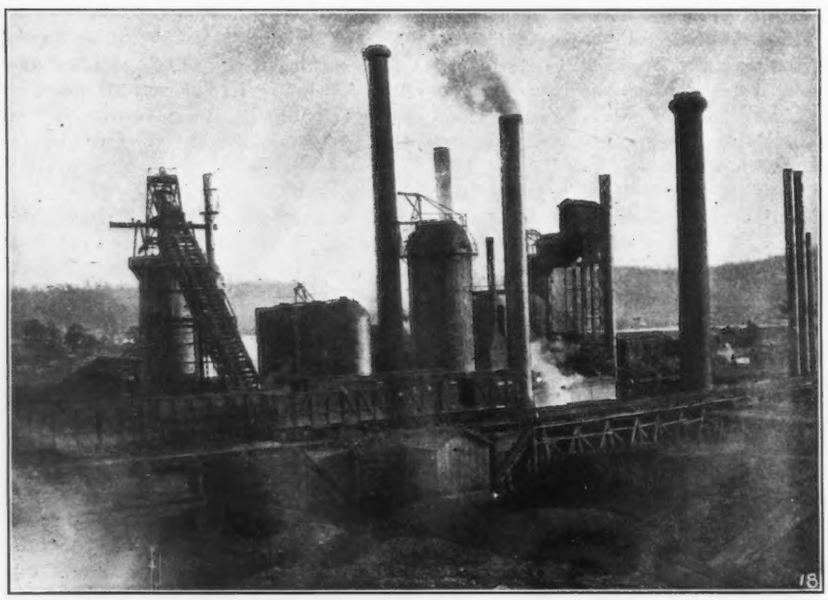


FIG. 10. NO. 1 FURNACE, ALABAMA CONSOLIDATED COAL AND IRON COMPANY, IRONATON

The foundry iron has about the following composition: silicon, 2 to 3 per cent.; sulphur, 0.3; phosphorus, 1; manganese, 1 and under.

The average cost of producting iron in the Birmingham district is $10 per ton, although in one instance it is being produced at a smaller figure. This exception is the Woodward Iron Company, with furnaces at Woodward, which is especially fortunate as regards the proximity of its raw materials to its furnace plant. On one side of the valley in which the furnaces are situated are the best iron-ore deposits; on the other side is the coal, while between the two the limestone occurs. The distance across the valley is only about eight miles, and the company operates its own line of railroad between its mines, quarries and furnace.

SMELTING OPERATIONS IN THE DISTRICT

A partial list of companies operating furnaces, with the situation of their plants and the number of stacks in and out of blast is given below:

Tennessee Coal, Iron and Railroad Company, six stacks at Ensley, four in blast; two stacks at Robertstown, one in blast; two idle stacks at Bessemer; one idle stack on the outskirts of Bessemer; one idle stack at Birmingham; two idle stacks at Oxmoor. This company operates a steel plant at Ensley. A rear view of the blast furnace and steel plant is shown in Fig. 9.

Sloss-Sheffield Coal and Iron Company, four stacks at Birmingham, two in blast; two stacks in North Birmingham, one in blast; three stacks at Sheffield and Florence, two in blast.

Alabama Consolidated Coal and Iron Company, two stacks in blast at Ironaton; two stacks in blast at Gadsden. No. 1 furnace, Ironaton, is shown in Fig. 10.

Woodward Iron Company, three stacks at Woodward, two in blast.; Southern Steel Company, one stack at Chattanooga, not in blast; one stack at Gadsden, not in blast; one stack at Rising Fawn, Ga., not in blast. This company operates a wire and nail mill at Ensley. Williamson Iron Company, one stack at Birmingham, not in blast. Republic Iron and Steel Company, three stacks at Thomas, two in blast.

Birmingham Iron Company, two stacks at Birmingham, one in blast. Shelby Iron Company, two charcoal stacks at Shelby, one in blast. Sheffield Coal and Iron Company, two stacks at Sheffield, neither in blast. Woodstock Iron Works, Inc., two stacks at Anniston, one in blast.

ECONOMIC AND INDUSTRIAL CONDITIONS

From the foregoing it may be observed that conditions in the Birmingham district are especially favorable for the manufacture of cheap iron. Iron ore, coal and limestone are found within a comparatively small area; the ores in many cases are almost self-fluxing. The excellent climate makes it possible to prosecute outside work the entire year; transportation facilities are good; labor is cheap, although inefficient and at times none too plentiful. The ore reserves are large, being second only to those of the Lake Superior district. From estimates by the U. S. Geological Survey, the total red hematite reserves of the entire district is 483,730,200 tons. The figures for the brown hematites will be omitted, as some of the estimates at hand seem rather vague; this must necessarily be so from the nature of the deposits. Doctor Eckel states that there are 50,000,000 tons of gray ore above the 1500-ft. level in eastern Alabama. Doctor Grasty says there are 5,000,000 tons of Cambrian red hematites in the Columbiana district.

Up to the time that the Tennessee Coal, Iron and Railroad Company started its open-hearth steel plant at Ensley, about four years ago, the market for pig iron manufactured in the district was confined to the buyers of foundry iron. The indications are that the manufacturers of basic iron will increase from year to year. The success of the Ensley plant and the demand for basic iron have served as a stimulus, and other companies are preparing to enter into this branch of the industry. There is no question but that the manufacture of basic iron on a larger scale would greatly benefit the district. The market for its product would be broadened and the manufacturers would be benefited by the profits on the finished material.

In past years the question was often asked, "Why does not Mr. Carnegie or the Steel Corporation go into the Birmingham district?" The fact that neither of these large operators seemed to take any interest in the district handicapped, to a certain extent, its development. In those days Mr. Carnegie was busy with the consolidation of his own properties. The Steel Corporation answered the question, when in November, 1907, it acquired $30,374,825 worth of the common stock and common stock subscription receipts of the Tennessee Coal, Iron and Railroad Company, this constituting all but $225,160 of the total. In this purchase the Steel Corporation assumed between $15,000,000 and $16,000,000 in bonds, and it is said it has spent in improvements between $4,000,000 and $5,000,000. It thus appears that the Steel Corporation has in the neighborhood of $50,000,000 invested in the district.

The advantages of the Birmingham iron district may be summed up as follows: (1) Large ore reserves; (2) low cost of manufacturing pig iron; (3) adequate transportation facilities and good climatic conditions.

The disadvantages may be summed up as follows: (1) Inadequate supply and inferior quality of labor; (2) limited market for the product of the furnaces. It might also be mentioned that much benefit would accrue from the expenditure of more millions in the improvement of some of the mining and smelting plants. These difficulties are not serious and will doubtless be gradually overcome. Judging from present conditions and indications for the future, it seems safe to predict that the Birmingham district will not only retain its position as an important iron-producing center, but will forge ahead and become of increasing importance as the years go by.

The Copper Deposits of Katanga

The directors of Tanganyika Concessions, Ltd., have issued an interim report showing progress made since the last meeting of shareholders, from which the following is extracted:

The smelting operations commenced on the Kansanshi mine last March have been proceeding satisfactorily. The latest advices from the mine show that 83 tons of bar copper were produced in the month of June, while Allan Gibb (the company's chief engineer) states that it is expected that at least 100 tons will be the normal monthly production from the present furnace.

Mr. Gibb's general conclusions as to the Star of the Congo mine, on which developments have been commenced with the object of preparing it to supply an output of at least 1000 tons of copper monthly as soon as the railway arrives, are summarized as follows: The copper-bearing beds are about 3500 ft. long and 500 ft. wide. At places fully 250 ft. of the width will not be of immediate value on account of mining or metallurgical difficulties. At places a considerable portion of the remaining 250 ft. is so low in copper as not to be of immediate value. The general cost of mining and delivering the two classes of ore to bins will be 4s. per ton of ore. The mine can be quickly put into condition to produce 12,000 tons of ore monthly, which will insure a production of 1000 tons of copper monthly. The bulk of the ore to water level can conveniently be removed by haulage arrangements that will not require shafts. There are 320,000 tons of ore with 15 per cent. copper available that can be directly smelted to bar copper at a cost of about 35s. per ton of ore, assuming coke can be delivered at £5 per ton. There are 900,000 tons of ore with 6.5 per cent. copper available that can be treated by the reduction method at a cost of 12s. per ton of ore. Large metallurgical works cannot be erected at any point nearer than nine miles from the mine.

The general investigation of the Kambove mine shows there are about 3,000,000 tons of ore in sight.

Treatment of Katanga Ores

The proposed scheme of treatment of the ores of Katanga is based on the fact that these ores occur, or can be readily separated into, two forms that are exactly opposite in character from a metallurgical point of view. The copper, so far as is known at present, entirely occurs in an oxidized form, and consequently can be reduced to metal by heating with carbon. The difference in the methods that will be adopted for the treatment of the two classes of ore arises from the character of the gangues that accompany the oxidized compounds of copper.

The two classes of ore may be generally described as follows: (1) Ore, usually containing more than 15 per cent. copper, of which the gangue may be fused in blast furnaces of a suitable type with the addition of moderate amounts of basic fluxes. (2) Ore, usually containing less than 10 per cent. copper, of which the gangue is absolutely infusible at or near the melting point of copper. This ore will be treated by the "reduction" method, in which the copper will be reduced to a metallic state and separated from the unsmelted gangue by water concentration.

The treatment of the smelting ore will present no novelties. Suitable slags will be produced either by admixture of various ores or by the addition of fluxes. The copper in the silicious ores will be reduced to the metallic state and fused to "shots," but no attempt will be made to fuse the attendant gangue. The reduced shots of copper are readily separated from the attendant vein stuff by mechanical concentration, and the concentrates will be fused into bars in reverberatory furnaces.

Railway Agreements

The following is a synopsis of the various railway agreements that have been entered into: The Katanga Railway Company to construct and finance railway from the Rhodesian frontier at Mabaya to Star of the Congo mine, thence eventually through the copper belt to Ruwe mine, and on to the navigable Lualaba river. £3,000,000 is being deposited with the Société Generale de Belgique to complete the first section from the Rhodesian frontier to the Star of the Congo mine. The Rhodesian railways to construct and finance its line from Broken Hill to the Congo frontier.

The following are the rates agreed upon The following are the rates agreed upon for the carriage of ores, metals, concentrates, etc., from the northern boundary of northwestern Rhodesia to Beira or any intermediate point: 1d. per ton per mile in respect of an annual tonnage of less than 250,000 tons. ¾d. per ton per mile in respect of an annual tonnage equal to or above 250,000 tons. ½d. per ton per mile in respect of an annual tonnage equal to 1,000,000 tons or more. The rates for the carriage of coal or coke imported via Beira or from any intermediate point in Rhodesia will be: 1d. per ton per mile for full trainloads of 300 tons. 1½d. per ton per mile for loads of 100 tons or upward, but below 300 tons.

A Lake Superior Iron Ore Dock

The largest ore-shipping dock on Lake Superior is now completed and will be ready for the opening of navigation next spring; it was first used on Oct. 28 last. This is dock No. 6 of the Duluth & Iron Range railroad at Two Harbors, Minn. Its cost was $1,125,000, and it differs from most of the Lake Superior ore docks in its construction, being all steel except the pockets.

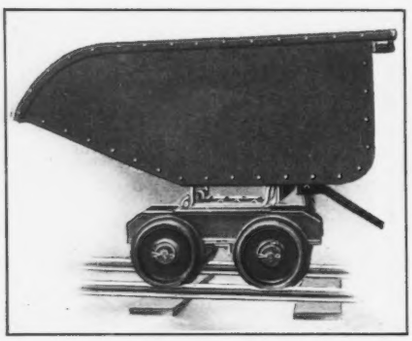
The dock itself is 938 ft. long; it is reached by a trestle 729 ft. long, of which 329 ft. is of steel construction and 400 ft. of wood. The deck is 73 ft. above water-level. The foundation is of timber cribs or caissons filled with rock and sunk to bedrock, on top of which rest concrete piers 9 ft. high, one-half being above water. The steel bents rest on these concrete piers. There are 74 timber pockets on each side, 148 in all, each holding 300 tons of iron ore; making the total storage capacity 44,400 tons. The length of the dock makes it possible to load four large steamers at once, two on each side. The loading is by spouts which convey the ore direct from the bins to the hold of the vessel. The ore pockets are 12 ft. wide from center to center of partitions, or 11 ft. inside. They are 30 ft. in depth at the outside and 3 ft. in the inside, averaging about 15 ft. They are lined on the sides with Washington fir and at the bottom with maple. The spouts are of heavy steel plates. The partitions in the last 10 pockets at the outer end are constructed of concrete in order to give the material a trial where there is heavy wear. Should it withstand the action of the falling ore, it is the intention to use this material in future construction.

The dock construction work was done by the Barnet & Record Company, the American Bridge Company furnishing the steel work. The engineer in charge was W. B. May, and William Bryden was superintendent of construction. In the work there were used 4500 piles and 11,000 cu.yd. of concrete for the foundation; 7500 tons of structural steel and over 2,000,000 ft. of lumber in the superstructure. It is a notable example of the great structures built to facilitate the handling of Lake Superior iron ores.

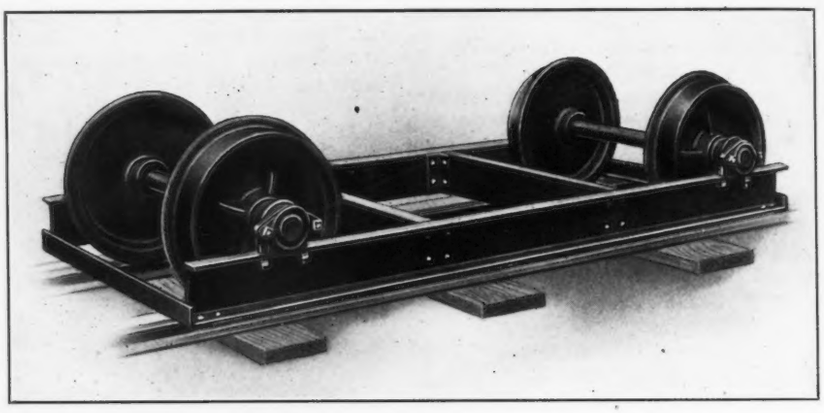
Youngstown Industrial Cars

In the JOURNAL of June 13 in an article on "Inclined Room Haulage" an arrangement was described for lowering loaded mine cars out of inclined rooms by means of a low transfer truck upon which the cars can be placed and shifted. An apparatus embodying the same principle and employed for the same purpose has been sold by the Youngstown Car Manufacturing Company for some years with its mining cars and industrial equipment. The truck illustrated in the JOURNAL as used in Belgium was a homemade affair, and was somewhat heavy for the purpose.

The Youngstown transfer car is shown in an accompanying illustration. The frame of steel channels is hung under the axles on roller bearings, thus providing a low platform. The truck is built in varying widths according to the wheelbase of the mine car to be handled, and the platform may be built to carry one or more tracks as desired. In moderate capacities, the construction shown is the one adopted, although it is modified to secure greater strength when necessary.



YOUNGSTOWN MINE CAR



TRANSFER TRUCK FOR MINE CARS

The truck shown is 6 ft. 6 in. long and 33 in. wide and is built for 24-in. gage cars. The top of the frame is only 5⅞ in. above the rail. Chilled cast-iron wheels 16 in. in diameter pressed on 2-in. axles constitute the running gear.

The Youngstown company also furnishes the necessary portable track for this arrangement so that the purchaser has only to procure a windlass and rope to complete his equipment for handling cars in the manner described. The truck illustrated is shown without platform or track; the platform is made of wood or steel plate as desired for any gage of track.

A type of mining car which has found a wide use is shown in the second illustration. It is a rotary dump car of scoop-shaped body so constructed that it is readily operated by one man. It is low and narrow. The box is made of heavy plates which vary according to capacity. The trucks on which the rotating table rests are of channel steel, while the turntable is made of steel plates and is equipped with a forged-steel hinge. The wheels are chilled and have a 3-in. tread and 1-in. flange. These wheels are usually of the self-oiling type. The cars are usually built for 18 and 27 cu.ft. capacity and in gages from 18 to 36 inches.

Mining Claims on Forest Reserves

A circular letter from J. H. Richards, president of the American Mining Congress, gives a letter from Gifford Pinchot, forester of the Department of Agriculture, with regard to complaints made by prospectors and others, closing with the request that a committee of the congress be appointed "to coöperate with the Forest Service in an effort to reach a mutual agreement, both as to the rules which should govern the Forest Service, under the law in dealing with mineral questions on National Forests, and as to the definition and interpretation of these rules, so that there shall be no misunderstanding whatever as to what is just and right for both parties in the premises."

In compliance with this request President Richards, through the executive committee of the American Mining Congress, appointed a committee which is known as the Forest Reserve Committee, composed of A. G. Brownlee, Hon. E. A. Colburn, W. F. R. Mills, William P Daniel and George J. Bancroft, of Denver, Colo. This committee has met several times in connection with the work in hand. It is now engaged in a compilation of the mining laws, and studying the regulations and instructions of the Department of Agriculture for the use of the national forests.

At this time the committee recognizes the necessity of securing full and complete statements of facts in specific cases where the regulations or the spirit of their enforcement by the Forest Service are alleged to have worked undue hardships or injustice upon men engaged in discovering, developing, or operating mines. To this end it invites the presentation in writing of all such statements of facts. Specific cases involving the use of timber, the mineralized character of claims located, rights of way over national forests for all mining purposes, together with the use or storage of waters for power purposes, or domestic use in connection with the mining operations of isolated claims, groups of claims, or affecting the economic problem of improved services throughout mining districts of territories will be considered by the committee upon a presentation of facts in the premises. All such statements should be addressed to the Forest Reserve Committee, American Mining Congress, 1510 Court place, Denver, Colorado. They will be regarded as strictly confidential by the committee if so desired by the persons sending them.

The committee expects to attend the session of the congress, to be held at Pittsburg, Penn., Dec. 2-5, to which Mr. Pinchot has promised to send some of the most liberal and best qualified men of the Forest Service to confer with it, in order that a better understanding between the mining interests and the Forest Service may be had, and an improved service result therefrom.

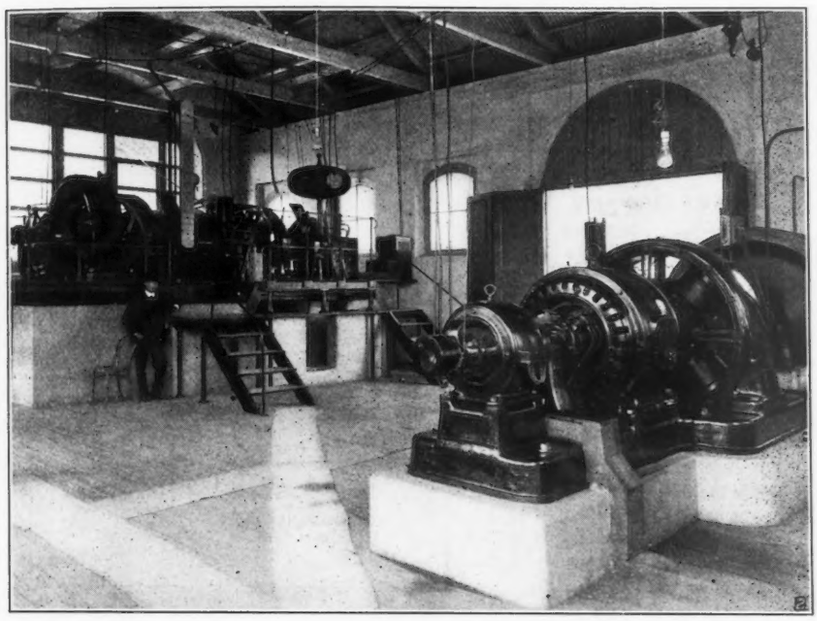
Greater Efficiency on the Rand

As showing the effect of the financial depression upon mining it is interesting to note that on the Rand, South Africa, in January, 1908, at 60 mines the average cost of mining, inclusive of development and redemption, according to *South African Min. Journ.*, Sept. 26, 1908, was 19s. 7d. per ton, while in August, 1908, for the same mines the average cost was 17s. 4d., showing a decrease of 2s. 3d., or a little over 10 per cent.; and this in spite of the fact that ever since the Boer war the cost of mining has been steadily reduced. The average stamp-duty per 24 hours for the whole Transvaal has been increased from 5.80 tons in January, 1908, to 6.17 tons in July, and in August to 6.23 tons. Formerly the hammer "boys" were required to drill 36 in. in a shift, now 42 in. is demanded together with, in many cases, two hours of shoveling. There has been a corresponding increase in efficiency in all the "boys" employed underground.

Some Features of Mining at Pachuca, Mexico

SPECIAL CORRESPONDENCE

There are several interesting points in the mining practice at Pachuca which were not described in our recent article on mining at Pachuca.[1]

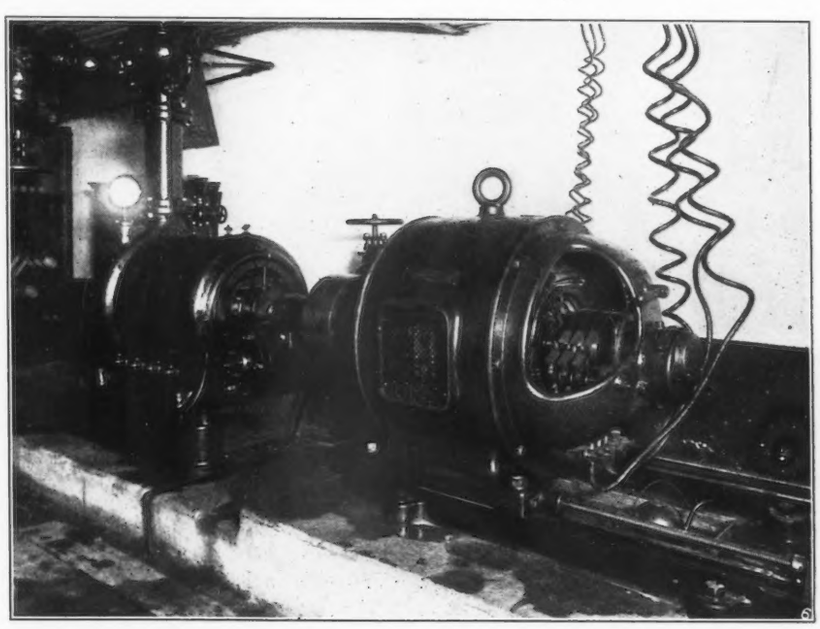


ILGNER HOIST, SAN RAFAEL MAIN SHAFT, PACHUCA

The most peculiar is the arrangement of the shafts. These are sunk more nearly square than is commonly the practice. Typical dimensions are 14.75x9.75 ft.; 16.4 x9.75 ft.; 13x8.2 ft.; and 16.4x11.7 feet. The shaft is given these dimensions because of the peculiar method of using the shaft space. Most of them were sunk since the introduction of Cornish pumps in the district; so they were made wide enough for the two cages to run side by side crosswise in one end of the shaft. This left the other end free for the pump-columns, pump-rods, and ladderways. This necessitates an awkward arrangement of the guides, since the outside ones must be placed in the middle of the loading tracks. In order to get the cars off and on, this guide is hinged on a tongue-rabbeted bevel joint so that it can be swung out of the way while loading.

THE CONTRA-TIRO SYSTEM OF SHAFT SINKING

The water in the district is confined to the veins; therefore a *contra-tiro* system of shaft sinking is used to cross the vein. In this method, a crosscut is driven from the bottom of the shaft. In this crosscut at a distance from the vein such that there is little danger of cutting a water-bearing fissure from the vein, the *contra-tiro* is started in the dry country rock. After this two-compartment shaft has been sunk to the level below, a pump station is cut, pumps installed, and from the bottom of the shaft a crosscut is started to the vein. When this crosscut has progressed 15 or 20 ft., it is enlarged so as to receive a masonry retaining wall 2 or 3 ft. thick, to which is hung a water-tight door. Pipes with regulating valves on them extend through this wall or bulkhead. After this masonry bulkhead has been completed, crosscutting begins again, a long hole being kept ahead as a precaution until finally a round of holes breaks into the vein. The iron door is closed and the retaining wall keeps this rush of water from drowning out the pump. The valves in the drain pipes are then opened until the pumps are working at full capacity. Pumping continues until the ground above the level has been drained sufficiently so that the pumps can handle the normal flow of water from the vein; the door of the masonry bulkhead is opened, and then a raise is started to the vein. In this manner the shaft is extended through the vein without danger of being drowned out. Later, after drifting has begun on the new level, the masonry bulkhead protects the mine from being drowned out, for whenever a rush of water comes, the door is closed and the lowest level used as a sump until the pumps can handle the flow again.



SULZER CENTRIFUGAL PUMP; 400-FT. LEVEL, SAN RAFAEL MINE, PACHUCA

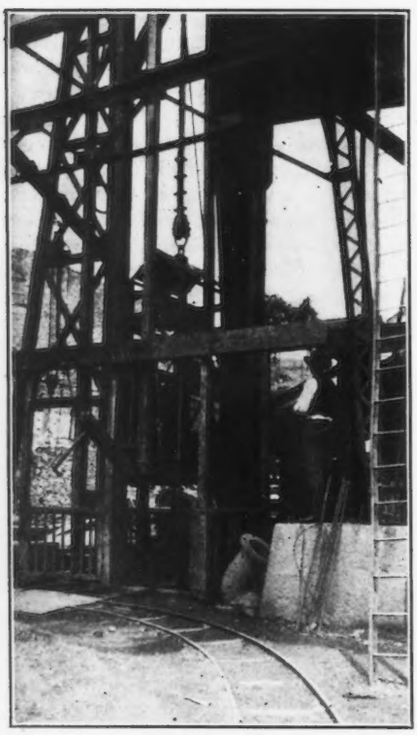
ELECTRIC SINKING PUMPS AT PACHUCA

At the Dolores shaft in Real del Monte a hydraulic elevator using inlet water under a pressure of 180 m. is used in sinking, but a No. 7 Cameron sinking pump will soon be used instead. At other shafts Sulzer centrifugal, electric sinking pumps are used, and at the San Rafael both a Sulzer and a Weiss-Monski centrifugal, electric sinking pump are used. These electric sinking pumps require about 5x4 ft. of shaft area, and weigh several tons. In order that the pumps can be moved easily in the shaft, they are mounted on cross-heads, which run along the guides in the compartment not used for hoisting, and a counterpoise is used to balance the weight of the pump and cross-head. The Sulzer sinker at the San Rafael mine has a capacity of 500 gal. per min. against a head of 35 m., while the Weiss-Monski sinker has a capacity of 600 gal. per min. against a head of 60 meters.

[1]The JOURNAL, Sept. 12, 1908.

The great disadvantages of centrifugal-sinking pumps are that they wear out rapidly; that they take up much more shaft room than air- or steam-operated, piston pumps that they are not capable of that variation in speed, that air- or steam-operated, piston pumps are; the regulation of the speed of pumping with them is inconvenient, as it can only be effected by the valve on the discharge pipe; and that they are heavy, necessitating special means for moving them. Consequently, electric sinking pumps have not, as yet, proved especially satisfactory.

For the stations, Koppe plunger pumps and Sulzer centrifugal pumps are used, both being electrically driven. The plunger pump is the more efficient, but the only Sulzer pump tested in the district



A TYPICAL SHAFT AT PACHUCA; OLD-FASHION CAGE-HOOKS AND SPLIT GUIDES ARE USED

had, when new, an efficiency of 69 per cent. A centrifugal pump costs only about one-quarter as much as a plunger pump, and the centrifugal-pump system is somewhat more flexible than the plunger pump, since it is capable of working under considerable overload for several hours. At the Barron mine a Sulzer octuple centrifugal pump is raising in one lift water from the 450-m. to the 50-m. level, a distance of 1312 ft., probably the highest one-stage lift in Mexico. This pump has a maximum capacity of 2250 liters against this head; it is run by a 350-h.p. induction motor, driven by a 1040-volt current and takes 163 amperes when running at maximum capacity.

The veins are rather wet, but the flow of water is notably greater when opening up and draining a new level. During this time sudden rushes of water are frequent. On this account a pumping capacity two to three times as large as required by the normal flow must be provided. For such extra pumps the electric centrifugal pump, owing to the smaller space required, less weight, and lower first cost, is preferable to a plunger pump, but for station pumps in constant use it is questionable which is the better; probably owing to its greater efficiency the plunger pump.

Narrow-gage Railways for Mines and Smelting Works

By Oskar W. Scholz[1]

For narrow-gage systems about mines and smelting works, wood ties and spiked rails are fairly satisfactory for yard tracks which remain permanently on the ground, but steel ties with the rails bolted to them are far superior for use on lengths of track that must be shifted frequently. Suppose a length of track, switches, etc., must be shifted in the course of a day. The spikes must be pulled out each time. Many spikes will bend and not come out straight. The spikes also tend to split the tie, loosening the rail and causing derailment and dislocation of traffic.

Industrial or portable tracks, or ready-made tracks supplied in sections 15 ft. long, are used for all kinds of industrial purposes, either to remain permanently, or to be shifted around as the work may require. Their main advantages are light weight, stability, and the fact that the ground on which they are to go needs little or no preparation. The sections consist of five metal ties with the rails attached by means of clips and bolts. To rivet the rails to the ties is not to be recommended especially for rails of smaller size, for the holes in the foot weaken the rails. Clips and bolts hold the rails and ties securely in place and allow, in case of breakage, quick and easy repairs on the spot. The ties are of rolled steel, with a corrugated rib in the center, which affords firm ground contact, strengthens the ties, and also prevents "buckling." The connections between the rails are made by regular flat iron fish bars. If, however, the tracks are not to be kept in place for any length of time, it is better to use connections which do not require bolting, such as light angle joints, etc. The total weight of one 15-ft. section is about 130 lb. for light rails.

Cost of Handling Material on Portable Track

The cost of handling material may be considerably reduced by the use of a suitable track system. In a railroad-grading contract about 25,000 cu.yd. of earth was removed, some of it with wheel scrapers and some with portable track and steel dump cars. The cost by wheel scraper for a haul of 350 ft. was 26.25c. per cu.yd., and by portable track and car for a haul of 600 ft. it was 24.25c. per cu.yd. The use of the portable track in this case thus represents a saving of about 25 per cent.

The conditions of location and traffic are those chiefly determining the track specification; the gage of the track and the rail section to be used are largely governed by the nature of the material transported. The accompanying table shows the approximate carrying capacity of the various rail sections.

CARRYING CAPACITY OF RAILS, MAXIMUM WHEEL PRESSURE IN POUNDS.

Weight per yard.	Distance from Center to Center of Ties.			
	3 ft. 3 in.	3 ft.	2 ft. 6 in.	2 ft.
12	1275	1440	1700	1920
14	1500	1700	1950	2240
16	1710	1910	2160	2450
20	2000	2200	2540	2900
25	3150	3540	4050	4620

There is no standard narrow gage, each manufacturer and each branch of industry having a different one. If the gage is wide, the road is expensive to build, requiring longer ties, more ballast, etc., and on account of the greater width required, cannot be built in places where a narrower gage could easily be used. It has been determined in actual practice that for most industrial purposes the 24-in. gage is most practicable. The cost for 36-in. gage is about 10 per cent. higher than for track of 24-in. gage. It is for this reason that nearly 90 per cent. of all light railways are built for 24-in. gage. A narrower gage than 24 in. should only be used if the space is limited, as, for instance, in mines where the track at times has to lead to parts which would otherwise be inaccessible.

The question of curves is often troublesome. To economize space it is desirable to make turns as short as possible, although with ordinary equipment the shortest turns permissible do not always meet the requirements. Thus, for a 24-in. gage track an 18-ft. radius curve is about as short as can be safely used. With especially designed rolling stock and track, much shorter curves can, however, be made, a curve with a radius as short as 12 ft. being permissible for use with specially designed cars.

In a recently installed industrial railway in a large plant there are no curves, turntables being used throughout. Though doubtless necessary in places where want of room prohibits curves, turntables should be confined as largely as possible to inside trackage.

[1]Engineer with the Arthur Koppel Company, Pittsburg, Penn.

Prospectors and Prospecting in Nevada

Definite Classified Information Is Hard to Get, and Precedent Is of Little Help in Searching the State for Its Mineral Deposits

BY ROBERT T. HILL*

The call of the West is always in me, and in the spring of 1908 the call drew me on a prospecting trip to Nevada, the land of geological simplicity and mystery, of mountain and desert, of heat and cold, of mines and hippodromes, of success and failure. In fact, Nevada has always been a land of surprises to the mining world, now "coming in" with some tremendous new discovery, and next languishing in depression of "busted" booms. Usually, however, each boom period results in the finding of one or two good staying camps, like Comstock, Ely, Goldfield, Pioche, etc.

I reached Nevada in a period of depression. Booms had boomed and "busted." The whole country had been staked out, and much of it had been abandoned in the period ending with the great failures and labor strikes of 1907. The general feeling was that there was nothing more to it.

Naturally my first step in going prospecting was to ascertain what ground to attack, and the best method was first to find out, as far as possible, what ground my predecessors had found favorable and what ground they had cancelled from the list of possibilities. There are three distinct methods of doing this, all of which should be followed by the prospector, for they dovetail one into the other. Unfortunately most prospectors fail because they only use one of the three. The first is to consult recorded knowledge and to equip oneself with all that others have found out, for this is the day of concerted and coöperative knowledge. The second is to cultivate the horny-hand prospectors, and to get the feel and touch of his personal experiences. The third is to visit and study every detail of an open and successful mine, typical of the region. I used all three methods.

A few geologist friends, such as King, Gilbert, Emmons, Powell, Hague and Walcott, had looked at the Nevada ground long before I had ever seen it, and each had in the literature of the subect recorded priceless observations. A younger generation, including Spurr, Ball, Ransome and others, had also made many recent descriptions. I was so fortunate as to have their scattered papers and maps. The paper by Ball[1] will be found especially useful to the prospector on account of the many facts and generalizations, including bits of literature, definitions of rocks, sketch maps, prospecting hints, etc.

The Prospector's Lore

A second method is to get the unrecorded observations of the hundreds of prospectors who have been over the country with burro and gold pan, and who, by careful research and hardship, have worked out the characteristic features of many unfavorable or favorable localities and areas. The exact method of getting this information can hardly be put in print, but there are numerous local academies of science called "thirst parlors" in the vernacular, where these savants rendevouz in their moments of leisure. Any stranger possessing a reasonable degree of "savey" can find admittance, and can soon establish a footing in the discussion.

The prospector and the geologist are brothers; both are studying the same thing, although one is content with the substance and the other with the explanation, and their success depends on rock knowledge. The difference between them is not great. It is mostly a matter of language. When they learn one another's language they become chummy. The "burnt out porphyry blow-outs all shot up with mineral," of the miner, are only phases of the geologist's "oxidized zone peculiar to certain metamorphic replacement phenomena."

Everybody in Nevada has the prospecting fever; men, women and children either go prospecting personally, or grub-stake someone else, and the saloon is the club house and exchange for all information. There are prospectors from the type of the young mining engineer with an automoblie, who wanted a $15,000 grub stake from a New York office, to the chef of the swell Goldfield hotel, who informed me that he was going out prospecting soon. The gambling dealers all invest their daily wages in grub staking, and even a woman brought in a rock which she had found in the road sparkling with free gold, apparently the pocket piece lost from some man's kit.

Having studied rocks and ores for a few years, but being unknown to the local people, I found amusement and instruction in asking apparently foolish questions, how they prospected, and how they told ore when they found it, the latter being a pertinent question, inasmuch as a peculiarity of most of the outcrops and ores of the newly described mining camp of Nevada looked nothing like any precedent that could be produced, and the prospector pure and simple is a slave to precedent.

The most intelligent of these prospectors was a lusty man, who tramped over the country with a galvanized-iron bucket half filled with water in one hand, a small frying pan for panning in the other, a geological hammer and a magnifying glass. He was of unusual intelligence, and could spot gold colors readily, but faulting, rock species, alteration products, alunitization, etc., were Greek to him. He was afterward of great service to me in locating values in formations, which I selected as favorable, but he had not then, and has not now, one idea of the law or type of ore occurrence in Nevada.

The Lack of Classified Knowledge

The most startling result of these inquiries was that, with one single exception, a man whom I shall cite extensively later on, I did not meet a man in Nevada who had the least conception of the law of characteristics of the ore occurrence, and I believe it is highly probable that today there may exist in Nevada rich, undiscovered fields of the Goldfield type, which the entire body of prospectors would pass over without recognition, or turn down as worthless.

But, alas! After we had received and digested all the literature that our geologic friends had given us, we were still in the dark; for none of this scattered knowledge has been systematized, and the great mineral State of Nevada possesses neither a geological survey nor a mining bureau to compile and sort it for us. When we turned to our prospector friends we also found confusion. They worked on precedent, and precedents taught them to look for good old indications that do not accompany these erratic Nevada deposits.

By reviewing the last economic cycle 1893-1908, panic through prosperity to panic, it may be seen that of the great mining discoveries which made good, most were of geological types unfamiliar to the prospectors and engineers and geologists of previous cycles.

This is especially true of the great copper mines which "came in," notably the Cananea, Ely, and Bingham camps, which are all of the types of more or less differently disseminated ores in replaceable igneous rock masses, showing little of the character of "true fissures," hanging walls, footwalls, etc., which the old-time miner always relied

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[1]Bulletin No. 308, United States Geological Survey. "A Geological Reconnaissance in Southwestern Nevada and Eastern California." By Sydney H. Ball, Washington, 1907.

upon, and for the lack of which many of them "turned down" the properties enumerated.

Near the beginning of the close of the cycle, the greatest of discoveries at Cripple Creek and the Goldfield, Nev., mining camps, also afforded examples of notable departures from the old ideals of the geological occurrences of gold ores, and furnished an example of gold disseminated and replaced in igneous rocks, under such conditions that the old miners, who would touch nothing but "true fissures," "good iron outcrops," and vein quartz with true "hanging" and "footwalls," completely failed to recognize the conditions which thousands of old prospectors and novices, floundering around Nevada afoot, on burros, in automobiles and private cars, still do not understand, unless they learn a great deal more about uptodate petrography than even most experts possess.

The third method of feeling the ground by studing a typical mining camp was still before me, and where could one turn for such a purpose to a better camp than Goldfield, and there I saw so much and learned so much that I concluded that really we had just begun to find out something about the laws of ore occurrence, as will be pointed out in a later article.

Utah Consolidated Copper Company

U. H. Broughton, of this company, has issued a statement to shareholders which contains the following:

In January of this year your company's smelting plant in Salt Lake valley was closed by order of the court, after the case had been carried to the court of last resort. Your company was then confronted with the proposition of building a new smelting plant in another locality, which meant the cessation of production for about a year and a half, or the alternative of entering into a contract for the smelting of its ores with the Garfield Smelting Company. In February of this year a contract was made with the Garfield Smelting Company for a period of one year. This contract was the best that could be made under the circumstances; by its provisions your company had the option, in six months' time, of extending the contract for a second year, and the right of discussing the questions of a certain modification and the making of a contract for a period of five years.

In July your company exercised its option to extend the contract for a second year, and informed the Garfield Smelting Company that it was prepared to take up the other questions. The Garfield Smelting Company notified your company that it would prefer to defer these questions for 90 days, which your company could not agree to, for the reason that certain options upon land adjoining the smelter site owned by your company expired on Oct. 1. Your company, however, agreed to a postponement until Sept. 24, upon the condition that its contract should run for 18 months from that date. On Sept. 23 the Garfield Smelting Company notified your company that it could not change any condition of the existing contract, but would make a contract for five years, "but not on any more favorable terms to your company." Your company immediately, as a protection, exercised its options on the lands adjoining its new smelter site.

Your company has now entered into a contract with W. D. Thornton, of Butte, for the smelting of its ores for a period of 10 years, commencing April, 1910, the proper performance of which contract is guaranteed by four persons acceptable to your board of directors. Under the provisions of this contract Mr. Thornton agrees:

1. To erect a smelting plant in Tooele county, Utah, to be in operation by April, 1910, and treat the output of your company's mines up to 1200 tons per day, at a rate which is 67.60c. per ton more favorable to your company than the contract now existing with the Garfield Smelting Company.

2. To buy from your company, at cost, all the lands and options it has acquired in Tooele county.

3. To give your company an option upon any part of $500,000 par value of the capital stock of the company to be formed to operate the new smelter upon as favorable terms as may be extended to any other taker or subscriber to stock.

The cost to your company of transporting ores to the Garfield smelter is 48c. per ton, while the cost of transporting ore to the Tooele smelter will not exceed 15c. per ton.

All figures in connection with the existing contract and that entered into with Mr. Thornton have been approved by E. P. Mathewson, of Anaconda, your company's consulting engineer.

Upon the basis of your company's present output of ore, 800 tons per day, the contract entered into with Mr. Thornton will result in a saving to your company, as compared with the contract now in existence, of over $300,000 per annum, or $1 per share upon the capital stock of your company.

Carnegie on Steel Production

Andrew Carnegie will have in the December number of the *Century* magazine, an article which he calls "My Experience With and Views Upon the Tariff," and in this he advocates the abolition of the duty upon steel. He thinks that steel is no longer an "infant industry." He says:

"The writer has coöperated in making several reductions as steel manufacturers became able to bear reductions. Today they need no protection, unless perhaps in some new specialties unknown to the writer, because steel is now produced cheaper here than anywhere else, notwithstanding the higher wages paid per man.

Britain and Germany are the only important steel-manufacturing nations other than ourselves. I am assured by one who has recently examined the matter that he found even in Germany today that the cost per ton for labor was greater than with us, unusually high as our wages are at present.

The United States made last year more steel (over 23,000,000 tons) than Germany, Britain, France and Belgium combined. New steel works are under construction which will produce enough to enable her to make more than the whole world besides. This she will do within five years, probably within three. The day has passed when any foreign country can seriously affect our steel manufacturers, tariff or no tariff. The republic has become the home of steel and this is the age of steel."

Uniformity in Mining Laws

In Pittsburg, Nov. 18, a conference was held at which many coal operators of the district were present. The chief subjects of discussion were the proposed Federal mining bureau and the movement to amend the mining laws and to secure uniformity in such laws. While no action was taken, it was the generally expressed opinion that better results could be secured through State action and the establishment of State mining bureaus, where they do not already exist. The radical differences between those States where coal mining is the important industry, and those where metal mining is conducted on a large scale were strongly urged. Another meeting is to be held, to decide on some definite course of action.

Governor Stuart, of Pennsylvania, on Nov. 18, issued a formal call and personal invitation to the governors of 16 States to meet in conference in Pittsburg Dec. 4, during the convention of the American Mining Congress. The governors are to be the guests of the congress. The purpose of the conference of governors is to secure uniform legislation.

The governors will take part in the discussion of the topic, "The Federal and State Governments in Relation to the Mining Industry," and following the discussion will go into executive conference. The invitations sent out by Governor Stuart were to the following governors of coal-producing States:

Braxton B. Comer, Alabama; Henry A. Buchtel, Colorado; Charles S. Deneen, Illinois; J. Frank Hanley, Indiana; Albert B. Cummins, Iowa; Edward W. Hoch, Kansas; A. E. Wilson, Kentucky; Austin L. Crothers, Maryland; Joseph W. Folk, Missouri; George L. Sheldon, Nebraska; Andrew L. Harris, Ohio; C. N. Haskell, Oklahoma; John C. Cutler, Utah; Claude A. Swanson, Virginia; William M. O. Dawson, West Virginia; Bryant B. Brooks, Wyoming.

The Rare Metals, III—Molybdenum

By Charles Baskerville*

With tungsten, molybdenum is commonly associated with granite. It is not found free in nature, nor is it widely diffused. The molybdeniferous minerals are:

MOLYBDENUM MINERALS.

	Metal Content.
Molybdenite, molybdenum disulphide	60%
Wulfenite, lead molybdate	25%
Molybdite, molybdenum trioxide	66%
Powellite, calcium molybdate	39%
Ilsemannite, molybdate of molybdic oxide	68%
Pateraite, cobalt molybdate	20%
Belonesite, magnesium molybdate	52%
Molybdoferrite, iron molybdate	....
Wehrlite, formerly considered an ore of silver and molybdenum	traces
Scheelite, calcium tungstate	5%

The first three minerals mentioned are commercial. Molybdenum is employed in metallurgy in the production of an alloy with steel. It can be substituted for tungsten in modern high-speed tools, and one part of molybdenum will produce approximately the same effect as two parts of tungsten; however, molybdenum is not so satisfactory an element as tungsten to use in high-speed tools. Molybdenum tools are brittle, have a tendency to fire-crack, are weak in the body of the tool, or else are irregular in their cutting speeds. Sodium molybdate is used in ceramics to impart a blue color to pottery, and in dyeing silks and woolens; molybdic acid is used in the preparation of chemical reagents. Molybdenum produces fast shades on leather just as titanium does, and a large variety of shades may be produced by using molybdenum tannate with logwood extracts. "Molybdenum indigo" (Mo_2O_7) is a useful but expensive pigment for india-rubber; it is said that it is not injurious to the material.

There is a steady and increasing demand for molybdenum.

Molybdenite

This mineral is the principal ore of molybdenum. It is usually a fairly pure compound, although a variety has been described containing 28.37 per cent. of bismuth. Molybdenite generally occurs embedded in, or disseminated through, granite, gneiss, zircon-syenite, granular limestone and other crystalline rocks. The largest deposits in this country are in Maine, New Hampshire, Colorado, Arizona, Montana, Idaho, California and Washington.

Molybdenite occurs in thin graphite-like scales or foliated masses of metallic luster and lead-gray color, easily separated into flexible non-elastic scales. It is sometimes found in tabular hexagonal forms, also in fine granular masses. It is soft and has a greasy feel; marks paper bluish-gray and porcelain slightly greenish. Its hardness is 1-1.5, and its specific gravity is 4.7-4.8. The cleavage is basal. Although twice as heavy as graphite, molybdenite is often confused with it. The two minerals may be easily distinguished, however, by the color of the streak on porcelain, and by the blowpipe reactions which follow:

In the forceps molybdenite is infusible, but at a high heat it imparts a yellowish-green color to the flame; on charcoal, the pulverized mineral gives a strong odor of sulphur in the oxidizing flame, and coats the carbon with a slight sublimate, which is yellow when hot, white when cold, and deep blue when touched with an intermittent reducing flame. In an open tube, sulphurous fumes and a pale yellow crystalline sublimate of molybdenum trioxide result. Molybdenite is decomposed in nitric acid, and leaves a white or grayish residue. With sulphuric acid, it yields a blue solution. The borax bead is yellow when hot, and colorless when cold in the oxidizing flame; and is brown to black and opaque in the reducing flame. The salt of phosphorus bead is yellowish-green when hot, and colorless when cold in the oxidizing flame; and emerald-green in the reducing flame.

When heated in a platinum spoon with niter, molybdenite deflagrates with a flash and dissolves in the fused salt, leaving yellow flakes, which remain undissolved when the mass is treated with water. In applying this test, the mineral is finely pulverized, and about three times its volume of niter is employed.

Wulfenite

This species occurs in veins with other lead ores, especially vanadinite and pyromorphite. It is found in Massachusetts, Nevada, Wisconsin, Missouri, New Mexico, Arizona, California and Pennsylvania. It sometimes contains chromium, vanadium, calcium, copper and iron. Wulfenite is found usually in thin, square tabular crystals, sometimes very thin, of yellow, orange or bright orange-red color and resinous or adamantine luster. The color is sometimes siskin- and olive-green, yellowish gray, grayish white, and almost colorless. It is found less frequently in granular masses, coarse or fine, and octahedral or prismatic crystals. Wulfenite is brittle and the streak is white. Its hardness is 3, and its specific gravity is 6.7-7. The cleavage is pyramidal.

This mineral fuses easily on charcoal, yielding a yellow coat and finally a metallic globule. The borax bead in the oxidizing flame is colorless; it becomes brown to black or dirty green with black flocks in the reducing flame. It dissolves in salt of phosphorus to a bead, which is yellowish green in the oxidizing flame and green in the reducing flame. When fused with soda on charcoal, it yields metallic lead. It partially dissolves in concentrated hydrochloric acid, forming a green liquid. If the solution is diluted and metallic tin is added, it becomes blue and finally brown. When fused with potassium disulphate in a platinum spoon, it forms a yellowish mass, which assumes a white color on cooling; this dissolved by treatment with pure water gives a solution which readily becomes dark blue on adding a piece of tin or zinc. A similar test may be made by boiling the finely pulverized mineral with sulphuric acid in a porcelain crucible or dish and then adding alcohol.

Molybdite

This mineral occurs with molybdenite, from which it is probably derived. It is found in New Hampshire, Pennsylvania, Georgia and California. Molybdite is found as an earthy powder or incrustation, and as hair-like crystals, tufted and radiated, and subfibrous masses. The luster of the crystals is silky to adamantine, and the color is straw-yellow or yellowish white. Its specific gravity is 4.5, and the hardness is 1-2. The streak is straw yellow. Molybdite fuses on charcoal before the blowpipe, yielding minute yellow crystals of molybdic oxide near the assay, becoming white near the outer edge of the coating and when cold. This coating assumes a blue color when treated with the reducing flame for an instant; continued heating produces a dark red color. The borax and salt of phosphorus beads give characteristic molybdenum color reactions (*vide* molybdenite and wulfenite).

Other Minerals

Eosite is a vanado-molybdate of lead. Its color is deep auroro-red, and the streak is brownish orange-yellow. It is found in Scotland.

Achrematite is a lead molybdate containing arsenic trioxide and lead chloride. It is a brittle, resinous mineral of an orange color, and gives a cinnamon-brown streak. It is found in Mexico.

Ilsemannite is a black mineral; it is soluble in water, giving a deep blue solution. It is found in Carinthia.

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South Rand Shaft, Transvaal

It is calculated that the South Rand shaft, now 180 ft. deep, which is being sunk to develop several properties, will cut the Main Reef series at a depth of 2200 ft. (*South African Min. Journ.*, Sept. 26, 1908). The shaft has seven compartments and is similar to the Turf mines, City Deep and Wolhuter Deep shafts; six compartments are 5x6 ft. within timbers, and one pump and ladderway 6 ft. 6 in. by 5 ft. 10 in. The estimated cost of this shaft is £38,000.

A peculiarity of the method of sinking this shaft is that the permanent headframe and plant were erected before sinking began, instead of proceeding with sinking and erecting a temporary plant immediately. The headframe is 104 ft. high and weighs 190 tons. From the 2200-ft. level, within a distance of 2500 ft. three different inclines are to be sunk on the vein to develop the deeper portions of the property.

Power Shovel for Underground Work

An innovation that has lately claimed the attention of the mineowners of the Joplin district is an installation of a power shovel for underground work. C. W. Landrum, resident general manager for the American Zinc, Lead and Smelting Company, succeeded in interesting Capt. R. Thew, of the Thew Automatic Shovel Company, of Lorain, Ohio, in the question of using a modification of the ordinary steam shovel in the mines, and the machine shown in the accompanying illustration is the result.

The machine has not materially reduced the number of men required for shoveling, but it can be operated by cheap labor; it handles an increased tonnage of ore, and has thus far never failed to supply the mill with ore.

The American Zinc, Lead and Smelting Company intends to install a second shovel, and a third is contemplated when the second is in working order. The first machine was a slight modification of the standard Thew shovel, the most important change being the adoption of compressed air in place of steam. The second shovel will be materially modified and adjusted to the peculiar requirements of this mining district. It will be lower in hight, and the radial reach will be reduced. There are accompanying features that will be worked out, as additional machines are installed, such as electric motors instead of men or mules for hauling the ore cars to and from the shaft, and other mechanical devices.

The plans for the second shovel to be installed give the following details of the improved machine: The approximate weight of the complete shovel will be 24,000 lb., and the clearance width 7 ft. 6 in. The swing of the boom when working will be 16 ft., and the clearance hight 12 ft. The swing of the rear end of the shovel will be 7 ft., and the radius of cut at a hight of 9 ft. will be 18 ft. The horizontal travel of the trolley will be 4 ft. 6 in., and the clearance hight of the dipper door in dumping 5 ft. The capacity of the dipper for ordinary use will be ⅜ cu.yd. The machine will have three engines: One, 5x6 in. for hoisting, a 4x5-in. for swinging, and the third, 4x5 in., for crowding.

The machine is built almost entirely of steel, and is mounted upon a truck propelled by one of the engines. The machinery is mounted upon a plate which swings from side to side as the movements of operation require. The operating levers are placed to one side near the front of the platform, and the operator stands upon a plate extension of the main platform.

POWER SHOVEL, OPERATED BY COMPRESSED AIR, AT WORK UNDERGROUND IN THE JOPLIN DISTRICT

Largest Hoisting Engines on the Rand

The largest hoisting engines on the Rand, South Africa, are those used at the mines of the Kleinfontein Gold Mining Company and the East Rand mines. The engine is of the cross-compound type, high-pressure cylinder 30 in. diameter, low-pressure cylinder 48 in., stroke, 5 ft. Each of the two drums carries 5000 ft. of taper steel rope, one-fourth being wound on the conical part and the rest on the cylinder is 20 ft. Inside each main drum the cone is 12 ft., and the diameter of the cylinder is 20 ft. Inside each main drum is an auxiliary drum on which is wound 400 ft. of spare rope (in excess of the 5000 ft. on the main drum). The size of the hoist is also indicated by the fact that the distance between the centers of the cylinders is 38 ft. 9 inches.

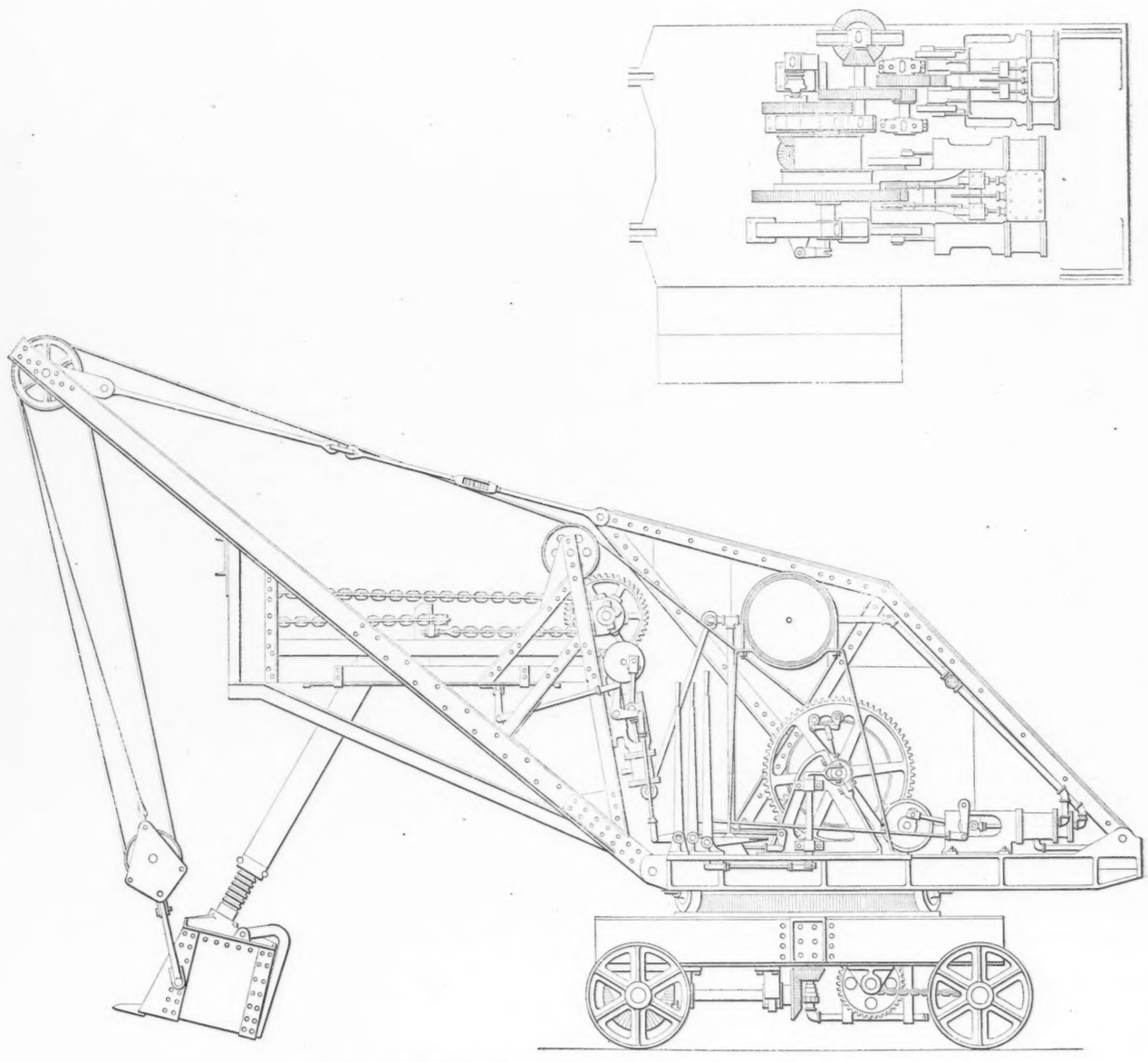
Buffalo Mines, Ltd.

In a communication to the stockholders of the Buffalo Mines, Ltd., of Cobalt, under date of Nov. 12, 1908, President Charles L. Denison says:

"I shall recommend to your directors the payment of a 5-per cent. quarterly dividend, followed by an additional extra dividend monthly of 1 per cent., and if conditions warrant, from time to time to pay such other dividends as may seem wise, beginning Jan. 2, 1909. I ask you to remember that our capitalization is moderate; our mine well developed; our veins unstoped. Our strength has not been misrepresented by record shipments of carefully selected ores, nor by large dividends obtained at a sacrifice to the proper development of the mine. We are today in a position to mine continuously from our developed ore reserves and to produce rapidly and cheaply, as our interests may warrant, saving as well the values of the extensive bodies of the lower grades of ore.

"We have demonstrated that the concentration of our ore is profitable; we have proved large orebodies; we have shown that dividends were paid from the earnings, while the development of the property progressed, and we have shown that we did not take out all the ore in sight for a temporary showing. Our plan of operation, our methods of mining, and our statement of conditions have been conservative. We have declined to prophesy or guess at values. There are now orebodies in sight greater in extent and of far greater value than I ever expected to see in this or any other property in Cobalt."

The concentrating plant has been built to its planned capacity and the company has installed a new electric pump, water lines and tanks, new boilers and boiler house, sampling and cyanide plants.



SIDE ELEVATION AND PLAN, POWER SHOVEL FOR UNDERGROUND WORK

Indian Gold Mines

The production of the Kolar goldfield in Mysore, India, in October, was 45,585 oz. bullion; which is 2163 oz. more than in September, and is the largest monthly production reported this year. For the 10 months ended Oct. 31 the total was 436,996 oz. bullion in 1907, and 437,841 oz. in 1908; an increase of 845 oz. only. The bullion reported this year was equal to $8,129,428, or 393,296 oz. fine gold.

The diamond-bearing pipe at the Premier diamond mine is probably the largest in the world. While approximately 20,000,000 loads of ground have been taken from the pipe, the average depth of working is only 75 feet.

Philippine Coals *

By Alvin J. Cox†

The subject of Philippine coal is of great importance to the islands. Although coal occurs so abundantly, Philippine coal is used only sparingly as a fuel. It has been employed on the small vessels plying along the coast with fairly satisfactory results, but largely owing to the undeveloped condition of the mines and the difficulty of transportation, it has come very little into competition with the coal imported from Japan and Australia. As a result, the development of commercial industries is handicapped by the high price of fuel. In view of this fact efforts have been made to foster coal production in the islands. W. D. Smith has made geologic studies of some of the more important coalfields, and I have investigated the quality and means of utilization of the coal from as many representative sources as could be obtained.

The older and larger deposits of Philippine coal known are on Batan island, Cebu and Polillo, although coal occurs in greater or less quantity in Negros, Mindoro, Masbate, Samar, Surigao, Zamboanga, Tayabas, Rizal, Lepanto-Bontoc, Nueva Vizcaya and elsewhere.

No Coking Coal Yet Found

The Philippine coal deposits resemble those of black lignite, but are superior to the ordinary lignite in every respect. It is rather the exception for these coals to have a brownish color, and they seldom show a woody structure. In appearance they are usually black and shiny, much resembling bituminous coal, but generally have a slightly lower calorific value than the latter. On the other hand, they have a much higher calorific value than ordinary brown lignite. The name "subbituminous" best describes this coal, since it conveys the most accurate idea of its nature and value. So far as is definitely known, all Philippine coals are non-coking. Although I have investigated coals from every available authentic source, not a single sample of coking coal has been found among them. A few samples from time to time have shown incipient coking, and recently one said to be from near Cebu, has been brought in which gives a coke having the appearance of being of good quality. This may be the beginning of a sufficient supply, and perhaps in the deeper beds coking coal may be abundant. The importance of such a discovery will at once be recognized when it is remembered that both iron and copper occur in the Philippines.

The quality of the Philippine coal will be shown by the following representative analyses:

Barring diluents, water, ash, and sulphur, it is surprising what a general uniformity there is in all Philippine coal, and this fact suggests, if no other reason were apparent, that it was all bedded under about the same conditions.

How best to utilize the coal deposits of this country is a question which has long attracted attention; however, little progress has been made toward its solution. I am at present carrying on some actual steaming tests under the boiler with as many coals as are available from representative sources. These, although not in all cases satisfactory, are encouraging. They were all compared with Australian coal used as a fuel by this bureau. The coal is "double screened and picked twice." The contract price delivered at Manila, piled in the coalsheds and yards of the civil government is 10.75 pesos per ton of 2240 lb. In considering the following data it must be remembered that the samples of Philippine coal were used as they came from the mine and were neither screened nor picked.

The loss of heat in the use of the Philippine coal was for the greater part through the smokestack, although a certain amount was due to fine coal falling through the grate. The following data will show these facts:

It has several times been reported that Philippine coal burns well when mixed with a certain proportion, say, 30 per cent. of Australian coal, or even slack. This condition would be anticipated. The effect is probably entirely physical. The Australian, which is a coking coal, would help to sinter together and retard the escape of the light particles of the non-coking native coal, until combustion could be effected in the range of the water-heating surface of an ordinarily constructed boiler.

The comparison of the theoretical and

TABLE I. REPRESENTATIVE ANALYSES OF PHILIPPINE COAL.

(Figures give percentages.)

Source.	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Ash.	Sulphur.
Batan Island:					
Bett's	15.41	39.46	41.01	4.12	0.22
Military reservation	7.44	35.26	44.81	2.49	0.25
Cebu:					
Near Carmen	16.70	35.10	43.92	4.28	0.67
Compostela	8.60	36.95	51.75	2.70	0.71
Danao	9.97	37.94	46.29	5.80	0.8
Polillo	5.90	39.29	48.82	6.00	....
Negros	15.90	35.44	34.37	14.29	0.99
Mindoro	15.35	46.26	32.24	6.15	....
Samar	15.24	45.38	36.36	3.02	....

These analysis were made by the "smoking-off method." The empirical methods usually employed for the analyses of coals are not applicable to those of the Philippines, owing to certain peculiarities of the latter.

TABLE II. STEAMING TESTS OF PHILLIPPINE COMPARED WITH AUSTRALIAN COAL AS UNITY.

(Figures give percentages.)

	Outcrop Coal From Batan Island.	Coalfield of Danao, Cebu.	Military Reservation, Batan Island.
Theorical heat value as determined in the calorimeter	69	91½	85½
Actual steaming value when burned under the boiler	63	84	66
Efficiency from the standpoint of the actual heat value	91	92	77½

TABLE III. FLUE TEMPERATURE WHEN VARIOUS COALS WERE BURNED.

(Degrees centigrade.)

	Australian Coal.	Batan Island Coal.	Danao, Cebu Coal.	Military Reservation, Batan Island Coal.
Average	360	440	389	413
Maximum	435	504	454	468
Minimum	330	440	391	385

TABLE IV. RELATIVE LOSS OF COMBUSTIBLE MATTER IN ASH.

Percentages.	Australian Coal.	Batan Island Coal.	Danao, Cebu Coal.	Military Reservation, Batan Island Coal.
Total refuse	13.3	...	6.1	18.8
Combustible matter in total refuse	22.32	...	28.9	36.5
Combustible matter of coal lost	2.97	4.5	1.8	6.88

*Abstract of paper in "The Mineral Resources of the Philippine Islands." Manila, 1908.

†Chemical laboratory, Bureau of Science, Manila.

the actual ratios in Table 2 is satisfactory when all the facts are considered. The fuel was all fired in the gridiron-grate furnace of this bureau, for which the usual fuel is Australian coking coal; in fact it is especially suited to and designed for the consumption of coal of this class. It is probable that a more satisfactory grate could be used for native coal, and I am convinced that a saving would follow by the use of a different style of furnace. A furnace with a short firebox, planned for a high-grade steaming coal which burns with a short, hot, smokeless flame, is entirely unsuited to Philippine coal. The firebox must be lengthened, or else a considerable portion of the fuel value of the volatile combustible matter, which approaches 50 per cent., will be lost.

Few of the Philippine coals form clinker; generally they are easily fired and burn well. This was the characteristic tenor of the reports of the officers in charge of the United States army transports "Chukong," "Sacramento," and "Palawan," when trials were made of the coal from Batan island.

Granting the usefulness of Philippine coal for steaming purposes, there are other points to consider, namely, the economy and the preservation of the supply. In developing, opening up and working the mines, there is always a large amount of outcrop coal and slack that is unsuited for steaming purposes, and which for sake of economy should be used.

It is believed, however, that recent experiments with gas-producer plants show a method by which these can be used. The gas-producing power of Philippine coals has been studied, and while the gas is not always equal to that of American bituminous coals in quantity, the quality is, in most cases, fairly good. There is no doubt that Philippine coals are well adapted for use in a producer plant. Physically they are ideal to handle. They are non-coking, they do not swell, they burn steadily, form very little clinker, and the ash could be removed automatically without difficulty. Slack and outcrop coal used in this way may become almost as valuable as better coal used in a steam plant.

With a satisfactory scheme for the use of the upper and poorer grades of coal, the mines can be worked successfully and the deeper coal can be used for steaming, where a producer plant and gas engine are impracticable. For the production of power, the utilization of our low-grade and outcrop coal for producer gas seems promising.

This bureau hopes to establish a trial plant at no distant date, and when it is in operation can add very definite data to present information.

As a general rule, air-courses should always have as large an area as possible; this reduces the rubbing surface per square foot of section.

Improved Methods in Mine Ventilation

SPECIAL CORRESPONDENCE

Until recent years it was the general opinion of mining engineers that the fans required for ventilation must necessarily be of large diameters. When, however, the turbine or multivane mine fan was invented, it became evident that this opinion needed considerable modification, and it became still more obvious when the results obtained with these fans under actual working conditions were made public.

The first installation where the "Sirocco" multivane fan was used, bore out the makers' claims, a 75-in. diameter fan of the double-inlet type not only doing the work of two other fans, whose aggregate diameters amounted to ten and one-half times that of the "Sirocco," but even delivering a 12-per cent. larger volume of air. This was only the first of many similar instances. At another mine, a 77-in. diameter "Sirocco" is replacing a fan measuring 44 ft. in diameter, while many others of less than 100 in. are being installed in place of fans of the old type measuring 30 to 40 feet.

ADVANTAGES OF REDUCED DIAMETER

Interesting though this question of reduced diameter undoubtedly is from the mechanical standpoint, it would be of little value if it could not show some advantageous features when considered also from a commercial aspect. The chief advantage of fans of small diameter lies in the fact that they can be run at comparatively high speeds, making it possible to couple them directly to motors or engines which develop the required power at high speed of rotation.

The first cost of the motor or engine is consequently very much lower than is the case of a slow-running fan, which often could not be direct-coupled, owing to slow speed necessitating the use of a large size motor or engine with the proportionate increase of cost.

The reduced dimensions of the high-speed fans lead to a marked economy in the cost of erection, owing to the small amount of brickwork and masonry necessary to provide their housing, and this fact is clearly evidenced when taking the actual space occupied by the fan wheels into consideration. Thus, taking an actual installation as an example where a wheel occupying a space of 325 cu.ft. is replacing another occupying 15,000 cu.ft., it is obvious that the amount of brickwork required to inclose the former is very much less than that needed by the latter. An additional saving is frequently effected in the reduced size of the engine and motor house, due to the use of a high-speed in place of a low-speed, and consequently larger dimensioned machine.

HIGH EFFICIENCY IS OBTAINED

Although the "Sirocco" multivane fans are small in diameter they are capable of fulfilling large duties, as is borne out by a number of installations. Tests have shown that a double-inlet fan 119 in. in diameter, is capable of passing 300,000 cu.ft. per min. at a 3-in. water gage, while another ventilator measuring 140 in. has been found to deliver 375,000 cu.ft. per min. at a 4-in. water gage. Furthermore, one of these fans is now in course of construction, which will have an output of half a million cubic feet at a 6-in. water gage, and will be direct-coupled to a motor of 1000 horsepower.

It has been sometimes argued that the slow-speed fans of large diameters show far better efficiencies than the smaller high-speed fans. This, however, is not the case, considering that a turbine fan is able to give an efficiency of more than 70 per cent. when tested under actual working conditions in mines.

Alaska's Great Coal Reserve

According to Alfred H. Brooks, chief geologist of the Alaskan division of the United States Geological Survey, it is not impossible that the area of lignite and low-grade bituminous coal in this Territory may be double the present known coal area, which is estimated at 12,000 square miles. The coal of Alaska ranges in quality from lignite to a fuel that compares favorably with the famous Pocahontas coal of West Virginia. Some of the bituminous coals make good coke. Several of the coal seams of the territory attain great width, reaching a total thickness of 60 ft. at many points. It is stated by those who are familiar with the Alaskan coalfield that this district is destined to play an important part in the advancement of all industry on the entire Pacific seaboard of the North American continent.

The minable coal, in the ground, in Alaska has not yet been definitely determined, and whatever estimates are made for some years to come, will doubtless be subject to wide expansion, as further geological explorations are carried forward. It is proper to say, however, that the coal resources of the territory are great, and that they will be figured at hundreds of millions, and even billions of tons.

The new Crescent mine, of the Monongahela River Consolidated Coal and Coke Company is one of the most carefully planned operations in the Pennsylvania coalfield. The mine has over three miles of underground standard-gage railroad laid with 60-lb. rails. Four-ton mine cars are used. The tipple has a capacity of 6 tons a minute.

An Underground Fire Disaster

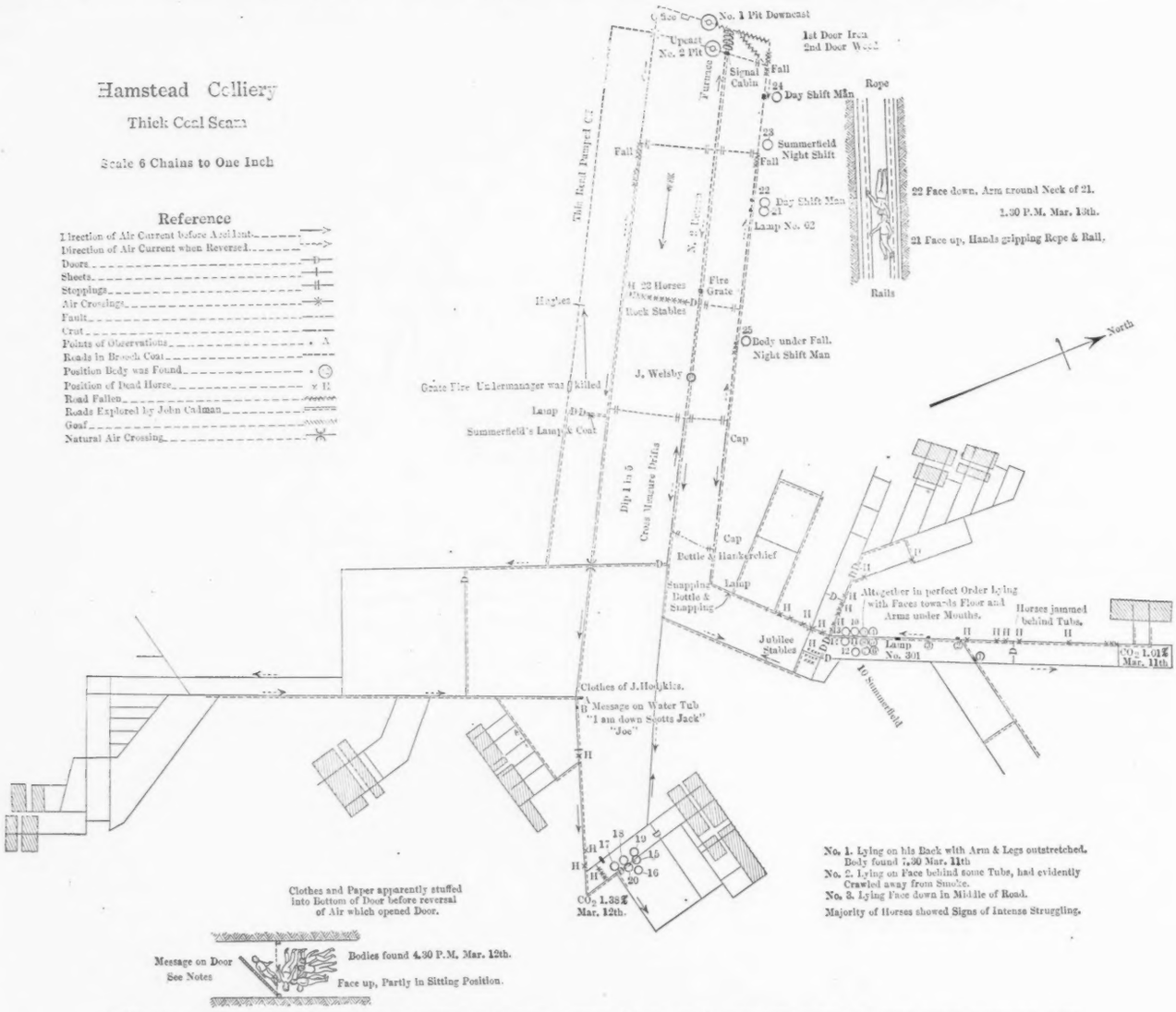
By James Ashworth*

The official account by the English Chief Inspector of Mines of the disaster which occurred at the Hamstead colliery in England having now been issued as a white paper, it is open to anyone who desires, at a cost of, say, 36c. plus the postage, to ascertain what that official has reported as the results of his special inquiry into the circumstances attending the underground fire at this colliery; the lives of 24 men, a large number of horses and also of one explorer named John Welsby (who was using the Weg rescue apparatus), were sacrificed.

This official document records something of the history of one of the most regrettable incidents in the annals of British mining, where the want of pluck and cool courage on the part of a few miners led up to the smothering of 24 of their mates, and the destruction by fire of property which provided a considerable population with their daily bread.

As if to atone for the first unfortunate incident, the succeeding phases of the attempted rescues were distinguished by almost reckless contempt of the insidious dangers of heat and gases resulting from the fire, and, therefore, in studying the plain facts, it is necessary to do so with as little sentiment as possible.

Here was a colliery 580 yd. deep, with a somewhat unfortunate history, mainly no doubt resulting from the frequent outbreaks of spontaneous combustion which are said to have averaged about one every two days. The seam is known as the Thick coal of South Staffordshire and was worked by means of downhill rock crosscuts from the level of the Brooch coal, and thus the pit bottoms and the haulage roads were for some hundreds of yards around the shafts in rock strata and entirely free from spontaneous fire troubles.


Hamstead Colliery
Thick Coal Seam
Scale 6 Chains to One Inch
Reference
Direction of Air Current before Accident
Direction of Air Current when Reversed
Doors
Sheets
Stoppings
Air Crossings
Fault
Crut
Points of Observations
Roads in Brooch Coal
Position Body was Found
Position of Dead Horse
Road Fallen
Roads Explored by John Calman
Goaf
Natural Air Crossing
No. 1 Pit Downcast
Upcast No. 2 Pit
1st Door Iron 2nd Door Wood
Furnace
Signal Cabin
Fall
Day Shift Man
Rope
Summerfield Night Shift
Day Shift Man
Lamp No. 62
22 Face down, Arm round Neck of 21. 1.30 P.M. Mar. 13th.
21 Face up, Hands gripping Rope & Rail.
Rails
Thin Rod Pumped Off
N. Dip
22 Horses Rock Stables
Fire Grate
Hoglea
Body under Fall. Night Shift Man
North
Grate Fire Undermanager was Killed
J. Welsby
Lamp
Summerfield's Lamp & Coat
Cap
Dip 1 in 5
Cross Measure Drifts
Bottle & Harkerchief
Snapping Bottle & Snapping
Lamp
Altogether in perfect Order lying with Faces towards Floor and Arms under Mouths.
Horses jammed behind Tubs.
Jubilee Stables
Lamp No. 301
CO2 1.01% Mar. 11th
To Summerfield
Clothes of J. Hopkins.
Message on Water Tub "I am down Scotts Jack" "Joe"
Clothes and Paper apparently stuffed into Bottom of Door before reversal of Air which opened Door.
CO2 1.38% Mar. 12th.
Message on Door See Notes
Bodies found 4.30 P.M. Mar. 12th.
Face up, Partly in Sitting Position.
No. 1. Lying on his Back with Arm & Legs outstretched. Body found 7.30 Mar. 11th
No. 2. Lying on Face behind some Tubs, had evidently Crawled away from Smoke.
No. 3. Lying Face down in Middle of Road.
Majority of Horses showed Signs of Intense Struggling.

GENERAL DIAGRAM OF HAMSTEAD COLLIERY SHOWING POSITIONS OF MEN WHO PERISHED IN THE UNDERGROUND FIRE

Cause of the Accident

On Monday, March 2, the winding engine at No. 1, or the downcast shaft, broke down, and coal-winding had to be discontinued, but the necessary repairs to the mine and the feeding of the ponies and horses were proceeded with as usual. During the change of the day and night shifts, about 5 o'clock on Wednesday the fourth, someone is supposed to have gone to a candle box, which stood on the south side of the top deck of the scaffolding of the three-deck caging arrangement, and after burning off one or more candles left the wicks of the others smouldering, and these, afterward bursting into flame, set the whole place on fire.

There were at the time three men in the office on the south side of the pit, but these do not appear to have perceived anything wrong until one of them coming outside, found smoke. About the same time smoke had also made its presence felt in another office or signal cabin on the inbye side of four separation doors on the north side of No. 2 shaft. The joint parties of men from Nos. 1 and 2 pits then appear to have tried to find a ladder by which to reach a water tap with the in-

*Mining engineer, Edgecroft, Rushton, Macclesfield, England.

tention of turning water on the fire, but, although they found the ladder they could not find the tap; as the electric lights went out and all made a *sauve qui peut* rush for the No. 2 shaft, and left the fire to burn itself out. Arriving at the surface, the timekeeper, who had come from the office on the south side of No. 1 pit, went to the enginewright, and asked him if No. 1 engine could be used, and was informed that "the engine was on the dead center and nothing could be done, for it would not go one way or the other."

What the enginewright meant is not by any means clear, because some time between this period, which has been variously estimated as 5:30 or 5:45 p.m., and 8:45 p.m., something must have been done as the engine was used for lowering the first of the rescue or investigating parties down the shaft, and it also appears to have been used for a similar purpose still earlier, as the report says that at 8:45 p.m., "a further and partially successful attempt was made to descend No. 1 shaft by a party consisting of the manager, enginewright and some others, about six in all." The history of this first descent is, therefore, from many points of view a very important missing link from the chain of evidence. Thus the simple fact that the cage or cages were moved up and down the shaft, and that the fire had not then burned the guide rods or in any way interfered with the free use of the cages stands out most prominently.

All Attempts Seemed to Fail

The report goes on to relate that the men descended to within 25 yd. of No. 1 pit bottom, but does not state whether or not any attempt was made to get at the water pipes, and thus play on the fire from this point of vantage. On returning to the surface, they reported hearing noises from falling materials, and in consequence of these noises nothing practical was attempted. In no part of the report does it relate what amount of destruction was done to the No. 1 pit bottom staging, or if the whole or what part of 30 to 40 trucks of coal standing on the north side were destroyed, nor to what extent the brickwork of this pit bottom was damaged by fire, nor why water was not poured onto either from the pipes in the pit, or from the surface.

It is useful to note that at this time between, say, 5:45 and 8:45 p.m., the fan had been stopped by the enginewright, but after the manager reached the colliery and his party had returned from No. 1 pit, say, about 9 o'clock, the manager ordered the restarting of the fan at about 10 r.p.m., and No. 1 shaft was again descended to within 10 yd. of the pit bottom. Again there is no mention of water and on returning to the surface, the fan was speeded up to 22 r.p.m. No. 1 shaft was again descended (called the third descent in the report) and this time the party could not get any lower, so they returned to the surface; still another descent was made, but the noise of heavy falls caused the manager to conclude that the venture was too dangerous and the exploration or attempted quenching of the fire at this pit came to an ignominious conclusion, and from this time the fire was allowed to burn unhindered. With this scant knowledge of the state and quantity of the burning material in and about the bottom of the downcast shaft, a party consisting of the manager and two others descended No. 2 pit, and got as far as the separation doors. Following up this dangerous exploration, the inspector of mines accompanied by the manager and three others then descended the pit and made a further examination of the separation doors and attempted to make them still more air-tight. This party accidentally made an important discovery, viz., that the air in the return was more respirable than that in the shaft, and another party led by the assistant inspector of mines descended the shaft, but the air had become too deleterious and they were unable to reach the pit bottom and had to return.

The Parties with Rescue Apparatus get Busy

The fact of the air in the return airway being more respirable than in the shaft does not appear to have caused any comment, and consequently the reason "why" does not appear to have been looked for, but its importance was clearly demonstrated later on when the brave Yorkshire men came on the scene with their rescue apparatus (Dræger and Weg), and the first party after visiting the separation doors and going through three of them to the fourth or iron door, went along the return airway toward the Rock stables and found a cat alive, thus a second time demonstrating that there was respirable air in that direction. This exploration was followed up by two of the Dræger party, accompanied by the manager, also wearing a Dræger apparatus, and this time two horses were found alive in the Rock stables. What had kept them alive? Clearly the leakage of air through the doors communicating with the south side of No. 1 pit, where there was the least quantity of burning material, and where the return air current had been "damped down" some days previously.

Had Whittinghame and Welsby been told to explore through the three doors in the stable road, there cannot be a doubt but that the trouble and danger of dealing with the fire would have been reduced to a minimum, and poor Welsby would have been saved from the inferno where he later on lost his life.

After the loss of Welsby everybody appears to have been agreed that there was no other cure than to reverse the air current, and if any reader of the report, or of these notes, is placed in a similar predicament, and has to decide whether or not he will reverse his air current, he had better carry in his mind the accompanying drawing showing the position of bodies 15 to 20, and the door close to which they had taken refuge and attempted to make as air-tight as possible with paper, etc.

The Death of Welsby

It is also important to note that the death of Welsby was not due to any failure of his apparatus but to the great heat of the mine which caused him to attempt to refresh himself by consuming his stock of oxygen through the bye pass instead of in the ordinary way through the apparatus. When another party of Dræger rescue men went in to try to recover his body they were driven back by the excessive heat and smoke.

Up to this point all the efforts made to get into the part of the mine where the majority of the men were at work were made under the supposition that they might have short-circuited the air current and be in an atmosphere free or nearly free from smoke. This, however, was felt to be a forlorn hope, and after the loss of Welsby it was decided to reverse the air current, and make the upcast into the downcast, but the colliery had not been laid out, as many American collieries are, with reversible fans, and therefore a great loss of time ensued through the making of a connection between the downcast and the fan. Unfortunately the report does not say what effect the reversal had on the various doors, but taking the one close to where the bodies 15 to 20 were found as an instance, it will be seen that the reversal opened the door and left the men exposed to the vitiated atmosphere they had to some extent escaped from. Even if the enginewright had been able to reverse the fan immediately the workings were by that time so full of smoke that it is extremely doubtful whether any one of the miners could have escaped alive, and as previously observed the only chance for the men was in the opening of the four separation doors near the pit shafts.

The novel and complicated means used to ventilate this colliery are altogether unusual; thus, two fire "grates" were placed in the return air ways, the one 430 and the other 620 yd. inbye from the upcast shaft for the purpose as stated at the inquiry, of "drying" the air, also at the foot of the upcast a furnace was used to assist the 36-ft. Guibal fan, which was placed on the surface. These combined means of producing a ventilating current of air in the workings, succeeded in moving 70,000 to 72,000 cu.ft. per min. with a water gage of 1.75 in. under normal conditions, but at the time of the disaster the conditions were not normal, both fire grates and the furnace being idle, and one return air road was blocked off.

WATER SHOULD HAVE BEEN USED

In these days of water sprays and other applications of water designed to restrict the extension of a firedamp or coal-dust explosion flame, the natural course would seem to be to have applied water in some form for the extinguishment of this fire, even if it were only thrown down from the top of the shaft; if water failed, flue dust or sand, or salt and water, might all have been tried to reduce the flame and heat sufficiently for the men to have got to close quarters and extinguish the remains of the staging bit by bit. One objection to throwing anything down the pit from the surface might have been that it would increase the ventilation and therefore increase the heat of the fire, but this objection would not be valid as the fan was kept running. The reason why water was not poured down the upcast to reverse the air was that the shaft needed repair at one point and it was thought that the water would make it cave in.

The occasions when it is necessary or convenient to reverse the ventilation of a mine are so infrequent that a reversible fan does not appear to be necessary, excepting only where the haulage-ways are liable to become frozen in winter weather. There is, however, a possibility that if a colliery were blown up through any case whatever, and the coal set on fire, eventually creating such a large volume of smoke as to drive the rescue parties out of the mine (as at the Maypole colliery, Wigan), the fan might be used to drive the smoke back again onto the fire and thus either put it out by smothering it in its own products, or so reducing it as to permit the miners getting to close quarters and extinguishing it. This mode of extinguishing an underground fire without flooding the mine, is suggested as being similar to that adopted by a mining engineer at the Leycett collieries, who allowed firedamp to accumulate and thus extinguish gob fires. To return to the Hamstead case, it may be queried whether, in the first place, a reversing of the air current could have been brought into action in time to save the men at work inbye if the fan had been a reversible one; and secondly if it would not have saved the men, had the products of combustion been brought back again over the fire, thus likely extinguishing it.

A Separate Lighting System

In underground lighting it is often considered desirable to have an entirely separate system for this purpose; in the event of an overload, the power circuit might temporarily be broken, and if the lighting were on the same circuit, it would also be cut off just when most required. Variations in load also might affect the lighting system if it were combined with the power circuit. For underground lighting the incandescent lamp should be inclosed in a gas-tight glass case.

Colliery Notes

As a general rule it may be considered that 12 ordinary by-product coke ovens will be capable of heating one boiler of about 8 ft. diameter, the steam pressure being about 120 lb. per square inch.

A Westinghouse locomotive weighing 15,000 lb. and running at a speed of eight miles per hour, exerts a draw-bar pull at full running load, of 2100 lb. on level; 1800 lb on a 2-per cent. grade, and 1360 lb. on a 5-per cent. grade.

When holes are charged with dynamite, but little good results from tamping, as the action of this explosive is violent and sudden. If, however, tamping is preferred, a 3- or 4-in. plug of clay backed on top by sand or gravel gives the best results.

In calculating the power required to operate a main- and tail-rope haulage system underground, the heaviest gradient on the road should be taken, and in addition to the friction of the cars and main rope, the friction of the tail rope must be considered.

The volume of air passing through a mine is directly proportional to the number of splits made, provided that these are of the same length and the power remains constant. The pressure is reduced in the same ratio as the quantity is increased under these conditions.

No policy at a coal-mining plant is more short-sighted than where quality in machinery is sacrificed to cheapness. In the long run, this plan is most uneconomical, for the breakdown of a cheap haulage plant, or other similar installation, will certainly result in a loss of time and output that will cost the company more than would have been required to install a reliable plant.

At a central electrical plant on the Continent, the working costs were found to be as follows: Three pounds of fuel produced 20 lb. of steam, which latter quantity of steam was consumed for each indicated horsepower. The fuel was here valued at 95c. per ton so that the cost, averaged over a period of time, was found to be about 0.2c. per i.h.p.-hour. The repairs and renewals to maintain this plant were found to be about 0.24c. per i.h.p.-hour.

The direct-current series motor gives a higher starting torque for a given current than any other type of motor. It should be remembered, however, that if a heavy starting torque is required, a heavy current will have to be used and a heavy starting resistance must be employed to take this current without undue heating. The direct-current series motor is usually designed to give its highest efficiency on light loads; the efficiency falls off rapidly as the load increases. A shunt motor usually gives its highest efficiency on about full load.

When fire occurs in the intake of a mine where many men are working, the circulation should be promptly stopped, and if possible reversed. An effort should be made to open all doors that will carry the smoke into the return airway. If for some reason the current cannot be reversed, then the intake should be immediately stopped off so as to prevent fresh air from reaching the fire. Only when the fire passes control and cannot be successfully fought by laying hose and throwing water on it, should steps be taken to isolate it by building dams and flooding the mine.

The question as to whether it is best to use a rope or a belt drive is a subject often discussed. The relative merits of each depend largely on local conditions. With a rope drive, there is certainly less chance of a breakdown, as the rope would break singly, while the breaking of a belt will cause some delay if not a serious accident. In determining the power that ropes will transmit, a common rule is to multiply the square of the diameter of rope in inches by the velocity in feet per minute and divide by 300; the result will be the power which may safely be transmitted by one rope. The number of ropes should be at least one more than actually required, so as to allow for changing, etc.

In discussing the question of accidents due to the short-circuiting of electric cables underground, one authority advocates the use of separate cables. This engineer claims that a heavy fall of roof breaking a concentric cable, would certainly cause a short-circuit at the point of fracture or crushing; however, if there were two separate cables, it would be necessary that each cable be simultaneously fractured and be connected with the earth before a short-circuit could take place. If these two separate cables were in separate roadways, it would be improbable that simultaneous fractures would occur from falls of roof; it is further suggested that if the two separate cables were in the same roadway, but on opposite sides, it is even then probable that one of the conductors would escape fracture.

There are, generally speaking, two types of arc lamps; first, the open or inverted type; second, the inclosed form in which the carbon, or rather the arc and part of the carbon, are inclosed in a glass globe arranged so that there is practically no circulation of air. Carbons that would last only about 20 hours in the open type will last about 200 hours in the inclosed type. Ordinary arc lamps require from 0.5 to 0.8 watts per c.-p., and it is usual to allow roughly one indicated horsepower at the engine of an electric generating set for each lamp of 1000 c.-p. Comparing the two types, the advantages lie mostly with the inclosed form; the latter consumes less carbon, burns for a longer period, needs re-trimming less frequently, requires but one-half the current, will burn on a higher voltage circuit and provides immunity from fire.

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Contents

PAGE

Editorials:
American Supremacy in Smelting Practice 1063
The Tennessee Acid Contract..... 1063
Silver Prices..... 1063
Blast Furnace Gas Power Plant..... 1064
*Has the Value of Gold Depreciated? *Walter Renton Ingalls* 1037
*Iron Operations of the Birmingham District.....*Edwin Higgins* 1043
The Copper Deposits of Katanga..... 1049
A Lake Superior Iron Ore Dock..... 1049
*Youngstown Industrial Cars..... 1050
Mining Claims on Forest Reserves..... 1050
Greater Efficiency on the Rand..... 1050
*Some Features of Mining at Pachuca, Mexico 1051
Narrow-gage Railways for Mines and Smelting Works...*Oskar W. Scholz* 1052
Prospectors and Prospecting in Nevada. *Robert T. Hill* 1053
Utah Consolidated Copper Company.. 1054
Carnegie on Steel Production..... 1054
Uniformity in Mining Laws..... 1054
The Rare Metals, III—Molybdenum. *Chas. Baskerville* 1055
*Steam Shovel for Underground Work 1056
Buffalo Mines, Ltd..... 1057
Indian Gold Mines..... 1057
Philippines' Coals.....*Alvin J. Cox* 1058
Improved Method in Mine Ventilation. *Special Correspondence* 1059
Alaska's Great Coal Reserve..... 1059
*An Underground Fire Disaster. *James Ashworth* 1060
Colliery Notes..... 1062
Correspondence:
Prospecting in the Government Reserves 1065
Loading Blast Holes. *Joseph Hocking* 1066
The U. S. Geological Survey..... 1066
Patents 1067
Personals, Obituaries, Societies and Technical Schools..... 1068
Special Correspondence..... 1069
Mining News..... 1071
Markets, etc..... 1077

Illustrated.

American Supremacy in Smelting Practice

The declaration of Andrew Carnegie that the steel works of the United States can produce more cheaply than those of any other country will create no surprise among the well informed, however inconvenient to some interests the statement may be at the present time. It has become well recognized by practical industrialists, as well as by economists, that the laborer is generally worthy of his hire. In mining the cheap native labor of India and the Transvaal does not result in a lower cost of production per ton of ore than with the high-priced labor of America, simply because the American miner is correspondingly more efficient. In metallurgical practice, besides iron and steel, it is well known that America leads the world in copper smelting and refining and in lead smelting and refining.

Even in the case of zinc smelting, wherein an unusual factor in labor conditions is introduced, it is believed by some authorities that the process can be performed as cheaply in the United States as in Europe, the somewhat higher cost for labor on this side of the Atlantic being offset by the lower cost of fuel. In some of the minor metals, such as nickel and aluminum, the United States is at no disadvantage as compared with Europe. Inasmuch as we do not smelt tin ore, this list practically covers the metal industry. If in any case our cost of production be higher, as in the case of much of the lead and spelter, it is because of the exceedingly low grade of the ore that we work, and the high freight charges resulting from conveying the products as much as 2500 miles by rail to the markets.

The Tennessee Acid Contract

An event of importance last week was the consummation of a contract between the Tennessee Copper Company and a recently organized concern called the Independent Fertilizer Company, whereby the latter is to take the sulphuric-acid product of the copper company for a long term of years at a price not announced, which, however, is understood to be very satisfactory to the copper company. The fertilizer company, moreover, in consideration of this contract agrees to pay to the copper company a large sum of money in cash, of which one-half is to be paid before the end of the present year, and the remainder at intervals later on. The Independent Fertilizer Company includes German interests that are closely identified with the potash syndicate.

This contract is an event of great importance to the Tennessee Copper Company, which has recently perfected its process of making sulphuric acid from the gases delivered by its smelting furnaces, this being a radical innovation in metallurgical practice. Naturally, many difficulties developed that had to be overcome by careful experimentation. The company contemplates the production of about 300,000 tons of tower acid per annum. The successful marketing of so large a quantity was a serious problem. The total acid consumption of the United States at present is probably in the neighborhood of 2,500,000 tons per annum, but of this only about one-half is used for fertilizer manufacture, and acid being a commodity that will not stand the freight charges to a very long distance from the point of production, the distribution of so large a new supply as that which the Tennessee Copper Company proposes, besides that which the Ducktown Copper, Sulphur and Iron Company is going to manufacture in a similar way, has been considered likely to create market disturbances. Whatever may now happen in the fertilizer industry, the Tennessee Copper Company is to be congratulated upon its success in disposing of its new product, hereafter to be more profitable than the copper product for which alone the property has heretofore been worked. The Independent Fertilizer Company is in no way affiliated with the American Agricultural Chemical Company or the Virginia-Carolina Chemical Company.

Silver Prices

The price of silver this week has fallen to a point almost the lowest on record; sales having been made at 49⅝c. in New York, and 22 15/16d. in London. This is in sharp contrast to the prices obtaining last year; but it is higher than five years ago, when for five months silver sold below 50c. in New York, while for two months more it was very little above that point.

The average price reported in New York for the month of October, just closed, was 51.431c. For seven months,

from October, 1902, to April, 1903, inclusive, it was below that point, the averages for those months in order being 50.57, 49.07, 48.03, 47.57, 47.89, 48.72 and 50.56c. Present prices, therefore, are not unprecedented. The highest monthly average price reported in recent years was 70.813c. in November, 1906. From that point for nearly a year the fluctuations were moderate, the average for September, 1907, being 67.792c. Then there was a sharp fall, 54.565c. being reached in December; while during the current year there has been a steady decline, broken only by a temporary rally in March.

In considering prices, it must be remembered that silver occupies a peculiar position, in that its production does not depend upon the demand for it. By far the greater part of the output is made in connection with other metals—chiefly lead and copper—and depends on the production of those metals. It may well be, therefore, that the supply of silver is greater when the demand for it is smaller. For the current year there are no reliable statistics of production, but as there has been a lighter demand for copper and lead, there may have been a smaller production from those sources. On the other hand, there has been an increase from the Cobalt mines of Ontario, so that it is quite probable that the total quantity put upon the market has shown little change from 1907.

The exports and imports of silver in the United States, which is next to the largest producer, for the nine months ended Sept. 30—the latest officially reported—were:

	1907.	1908.	Changes.
Exports.....	$47,970,793	$38,781,380	D. $9,189,413
Imports.... ...	34,488,224	30,725,475	D. 3,762,749
Net exports..	$13,482,569	$ 8,055,905	D. $5,426,664
App. ounces...	20,103,100	15,031,100	D. 5,072,000

The decrease in value of the net exports this year was 40.2 per cent.; the decrease in quantities, owing to the lower value, was only 25.2 per cent.

The main cause for the decline in values is, as usual, found in the Far East. It is somewhat remarkable, however, that while there was a decline of 16.7 per cent. in the value of the exports from London, the market from which the East is generally supplied, there was, apparently an increase of 4.3 per cent. in the quantities, as shown in the table below.

Export of silver from London to the East for the 10 months ended with October were as follows:

	1907.	1908.	Changes.
India.....	£9,899,954	£8,171,813	D. £1,728,141
China.....	99,850	516,400	I. 416,550
Straits.....	625,950	164,885	D. 461,065
Totat.....	£10,625,754	£ 8,853,098	D. £1,772,656
App. ounces..	82,333,200	85,879,500	I. 3,546,300

From this table it appears that India has taken at least the same quantity of silver as in 1907, but there has been a large decrease in other Eastern countries. The Straits are practically out of the market. China took some quantities early in the year, but since then has been a seller, not a buyer, disposing of the surplus metal taken two years ago, chiefly in India, but occasionally in London. These sales, which were combined with bear operations conducted by large Chinese operators, have been an important factor in depressing the price.

There have been minor contributing factors to the depression. The demand for silver for use in the arts has been small, in consequence of the general condition of business. The United States Mint has not been a buyer since early in the year. European mints, except the French mint, have taken less than the usual quantities. While of less importance than the trade with the East, these factors have had their effect.

Blast Furnace Gas Power Plants

While all the large iron-making countries have shown decreases in pig-iron output this year, and a general depression in business, Germany reports the smallest loss. For the eight months ended with August the total make of pig iron was only 7 per cent. less than in the corresponding period of 1907. This decrease is less than that in steel and finished material, so far as statistics are accessible; and it is reported that many furnaces have accumulated large stocks of unsold or unused iron, the existence of which is depressing the market.

One reason for this small decrease and the piling up of stocks is suggested by some of our French and German contemporaries. This is the widespread adoption at many German works of gas-engine plants operated by the gas from the furnaces. In many cases these plants not only supply the power needed for blast and other purposes about the furnace itself, but also generate electric power which is used to operate rolling mills, lighting plants and other parts of the works. Hence it is necessary to keep the furnace going to supply power, even if the iron is not needed. Unless there is a general shutdown of the entire works, the power plant must be kept in operation.

This was one of the objections suggested when the use of blast-furnace gases was first introduced. The objection was disregarded, in view of the many advantages and economies to be secured. That it may have some real weight seems now to be in progress of demonstration. A remedy suggested is the provision of gas producers to supply the power plant when the furnace is out of blast. The objection to this is, of course, the first cost. It may be a fair question, however, whether it would not be cheaper to install the producers than to carry heavy stocks of iron from furnaces run chiefly to furnish power.

IT IS OF interest to note that the United States Steel Corporation has decided to establish a special bureau of scientific research. More or less research has accompanied its various operations, of course, but it has been incidental and has depended largely upon the officers in charge of the several plants. The object of the new bureau is to systematize investigation and to bring together data which will be useful. The bureau will have a building of its own at the Duquesne works, near Pittsburg; its first head is to be John S. Unger, now assistant general manager of the Homestead works.

THE GERMAN iron market has been feeling lately the depression of business to a considerable extent. The dissolution of the Rhenish pig-iron syndicate, which was due, it is said, to the impossibility of maintaining prices longer, has had the effect of demoralizing the market. The quotation for steel-making iron has fallen to 60 marks ($14.28) per ton, and for average foundry to 50 marks ($11.95). The market is further affected by the existence of large stocks of unsold pig iron, said to be over 700,000 tons. It is, apparently, another case of the failure of combinations to maintain prices in the face of declining consumption.

ARIZONA IS NOW producing more copper than ever before in its history, and the outlook is that in 1908 this Territory will retain the position as the premier producer of copper which it gained in 1907.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Prospecting on the Government Reserves

I have read with a great deal of interest the JOURNAL'S editorial on "Prospecting on the Government Reserves," as well as previous articles and discussions on the subject. I rather hesitate to attempt anything on the subject on account of the scope and the false light in which the matter has been placed before the people of the country at large and the general ignorance of the public as to the actual conditions. I shall try to be brief and consume as little space as possible while turning on a few sidelights.

Out of all the discussion the question arises, From whom do all these complaints come? Who is propagating all this discussion?

Title XXXII, Chapter 6, Revised Statutes states:

Sec. 2318. "In all cases lands valuable for minerals shall be reserved from sale, except as otherwise expressly directed by law."

Sec. 2319. "All valuable mineral deposits * * * are hereby declared to be free and open to exploration and purchase, and the lands in which they are found, to occupation and purchase, by citizens of the United States * * * under regulations prescribed by law * * *."

Sec. 2320. "Mining claims upon veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits, heretofore located, * * * but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located."

Sec. 2329. "Claims usually called 'placers,' including all forms of deposits, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivision of the public lands."

WHERE THE TROUBLE ARISES

From these quotations from the statutes, it is certainly plain that: "It was not intended by Congress in passing these laws that prospecting should be prevented in any way," nor was it intended that these laws made for the purpose of developing the mineral resources of the country should be used for the passing of title to these lands for any other purpose. I think that I am absolutely safe in saying that the *bona fide* prospector has in no way been prevented from carrying on his prospecting in the Public Forest Reserves, or in making his locations, either by the representatives of the Forest Service or, "through another bureau of the Department of the Interior," reference here probably being made to the special agents service of the General Land Office.

The land laws state what lands can be taken under each kind of entry; the entryman makes his filing, and until he asks the Government to give him title to that land, the Government asks no further questions. When it comes to the point of passing title to its lands, and there seems reason therefor, an investigation may be ordered.

Herein is where the confusion arises over the rights in the Forest Reserves, and the fact is overlooked that there are several steps in the perfecting of a title to a mining or any other claim. It is manifestly at the point of asking for patent that all the trouble arises; this will be found on inquiry to be the fact, and right at this point we may ask, Is this law that has been characterized as "one of the antiquated laws remaining on our statute books, and has for so many years been conceded to be so irrational that by common consent it has been disregarded," after all so irrational and dead? In answer the following questions become pertinent: (1) If the law is to be disregarded, where is the prospector to set his stakes? (2) Will a practical prospector set up his stakes before he knows his vein or lode, later to find that he has a small section of a vein cutting through one corner of his claim? (3) Suppose that the first is answered by saying that he will make his record from his discovery(?) shaft, locating his lines thereby, the shaft being arbitrarily sunk, and he proceeds to spend $500 for development work in sinking this shaft 50 ft. deep, or perhaps in running a tunnel. Suppose he then asks the Government for a patent; shall the Government give him a patent to that claim? Most emphatically, no! The authority for refusing lies in Section 2320 of the statutes.

NO PATENT BEFORE DISCOVERY

The same is true of the placer prospect. The prospector makes his discovery and locates his ground accordingly, or on surveyed lands by legal subdivisions. Let us assume that he is ostensibly looking for the "deep lead" and starts his deep shaft or long tunnel, does $500 worth of work, and asks the Government to patent the land, stating that he has not yet attained the supposed object of that work. Shall the Government issue patent to him for that 160 acres of land? Again no!

There is no law, nor are there any instructions that will disturb a man in his peaceful possession and operation of the claims as located in any of the above instances, but without that law and without its vitality, how many acres of valuable timber or agricultural land would be alienated from the people of the United States for the magnificent sum of $500 actually spent, or so sworn to?

No man has a right to apply for patent until he has made the discovery that the law calls for in Section 2320, and has done his $500 worth of work. Then he is entitled to a patent just the same as the man who has made his discovery and proceeded to the expenditure of the $500, after which, and not before, he is entitled to his patent.

HOW EVASION WORKS

There is a class of prospectors who work outside, and are, in their own minds, much abused by the Government. These men, possibly representing a mining company, or a contractor, wish to secure timber from a forest on Government lands, in all probability not classified as mineral land, and, therefore, not open to cutting of timber. The land must, therefore, be made mineral(?) land.

A number of claims are located, this "antiquated law" is disregarded, $500 worth of work is done (or sworn to in the returns, which amounts to the same thing), and patent is asked for; or perhaps this formality is passed, the claims have been "located," and therefore the land *is mineral*, the foundation of the whole fabric being the disregard of the "antiquated law." They are then ready to take from the lands of the people of the United States the timber that should be adding to the treasury of the people.

Now as to the forest reserves: First, what entries can be made within a reserve? There is but one class, mineral entries. There is a trait in human nature that perpetually leads men to desire to possess something, be it what it may, by other means than those plainly provided. The wild fowl, hare and deer in a hunting preserve are more to be desired in the eyes of the poacher than are the denizens

of the free wood. So with the farm, the timber and the water power of the forest reserve; but how shall the poacher poach on those? There is but one avenue, the mineral claim. The poacher goes upon Uncle Sam's timber preserve, digs a hole, or more often the pretense for one, and locates as many 20-acre lots as he will, covering the timber or farm land, swears to $500 worth of work, and asks the Government to give him title. Has he discovered a "vein or lode within the limits of the claim located?"

If this fails, or is inconvenient, he with several associates (accomplices) takes up twenty or thirty 160-acre placer claims; he does a little work here and there, has the land surveyed and asks for patent. The poachers have not noticed the timber, or if they have, only so far as it will increase the expense of their operations(?). Have they made a discovery of value in the limits of the claims located?

THE CRY OF PERSECUTION

When this point is reached the Forest Service steps in, and as "the Forest Service cannot legally eject prospectors from its reserves," it calls in "that other bureau of the Department of the Interior," evidently the special agents, who make an investigation and report to Washington. A hearing is ordered and the mineral inspector of that department together with an expert miner of the Forest Service and possibly a geologist of known reputation from the U. S. Geological Survey, make an impartial examination of the land in controversy, and go into the hearing to present their testimony and to stand a rigid cross-examination by the best lawyers obtainable for the purpose. Then the local papers are full of the cry of persecution of the poor prospector, congressmen and senators are appealed to to use their influence with the department, and the men locally employed are slandered and abused. In not a few instances "the poor prospector" takes the brunt of these investigations, for whom?

This is the story of the persecuted prospector. Go to any of the *bona fide* prospectors on the reserves throughout the West and you will hear of no complaints. The howl has been made by those who have been snared in their own meshes, who have appealed to their representatives with a tale of woe, one side only being told, the circle ever widening until we see the story in prominent journals. This gives some color of truth to the charge and misleads the uninformed reader to the conclusion that the Government of the United States is a tyrant and a despot to those hardy pioneers who have blazed the way of the empire through desert and mountain.

It appears, therefore, that Section 2320 is as full of vitality and of as much importance in the chain of land laws as any section ever enacted by Congress, and that without it the West would be one orgy of land grabbing, bad as it has been in the past and bad as it is today, in spite of constant vigilance. The dialogue between the supposed prospector and the forest ranger has that familiar ring of the stump speeches of the late campaign, from the lips of those who opposed the administration.

MINING ENGINEER AND PROSPECTOR.

Denver, Colo., Nov. 10, 1908.

Loading Blast Holes

I note that the article on "Speed in Small Drifts," in the JOURNAL of Oct. 17, has brought out some discussion as to how to charge a hole.

I think the method used in Mr. Adkinson's article to be the best in that case. It is evidently less labor to remove the primer in case of a missed fire if the primer is the last put in, but I see no reason for removing the primer if there is but a small quantity of dirt of some kind, say, 4 in., on top of the primer. All that is required in case of missed fire is to place another primer on top of it. I believe that where the fuse has not been damaged by water before it is put in the hole or after, it is a defect in the making that caused the missed fire.

J. K. Hay must remember that 35 years ago miners used a hammer on an iron bar to tamp holes. I do not think the tamping stick or the doubling of the fuse is the cause of but few missed holes. The all-prevailing method here in this district (and I presume there are more holes blasted in the copper country in one day than in any other mining camp in the world), when there are several holes to be fired at one time, is to make a difference of about 4 to 6 in. in the length of the fuse, and after the hole is charged, to place all the fuse with the exception of 6 in. in the hole.

THE PRACTICAL MINER

The drifting done in Mr. Adkinson's article no doubt beats the record. At the same time I think 10 holes should have done the work of the 15. Taking it for granted that Nos. 8 and 9 took the cut, eight more holes properly placed should have done the rest of the work. In my experience in small drifts it requires about one-half as many holes to take the cut as are required to square it after it is taken.

Where two holes drilled at an angle of about 20 deg. from the horizontal, 6 ft. deep in the breast of a drift would break to bottom in taking a cut, it evidently must be very fine rock to break.

J. K. Hay has not a very exalted opinion of the miner. He says that mining is no trade, and that miners as a class follow the leader. He says that owing to the greater complexity of mining problems it is rare that the prospector or the working miner works himself up to a place higher than foreman.

Now I think miners have as much brains as other men; 20 years ago, 90 per cent. of the mining superintendents had risen from the ranks. But these old men have dropped out and their sons, or some other younger men, have taken their places. Some of them are mining-school graduates who can write a good report, but who would be in a tight place if they had not good miners as mining captains under them. The best way to get miners to do good work is to set them a contract. They will work their brains as well as their muscles if they have some inducement to do so.

JOSEPH HOCKING.

Opechee, Mich., Nov. 18, 1908.

The U. S. Geological Survey

I was greatly pleased to see the remarks at p. 866 of the ENGINEERING AND MINING JOURNAL of Oct. 31, 1908, apropos of the work of the U. S. Geological Survey. The case was diagnosed perfectly. The complaint that the Survey is not attending to its legitimate work is invariably met with the same clap-trap excuse; that it is required by law to do all these odd jobs. And the odd jobs are given the Survey at its own suggestion, and largely because it wants to have the handling of any funds voted by Congress. The August-September number of *Economic Geology*, p. 568, gives what is probably an authorized statement of the specific appropriations for the Survey for the year 1908-9. These include $75,000 for forest reserve topographic surveys, $100,000 for water resources investigations, $100,000 for structural materials investigation, and $250,000 for fuel-testing investigations; a total of $525,000 for work that, however useful and important, is not geologic in any proper sense of the word.

The JOURNAL refers to the "high mark of its past history," and might have shown, had it cared to do so, that that high mark was not attained with the million dollar appropriations that swept the work of the Survey into every congressional district in this country and even into foreign lands, but in the early days of its existence when its more modest appropriations necessarily compelled it to stick to geology.

It is a great pity that it is not still poor enough to mind its own business, and to have that spirit of humility that goes with good, conscientious work.

New York, Nov. 10, 1908. GEOLOGIST.

The average cost of dipping or brushing new timber with preservative, according to a statement made by E. F. Hartmann, of the Carbolineum Wood Preserving Company, before the American Street and Interurban Railway Engineering Association, is $8.33 per 1000 ft. board measure. The cost of treating railroad ties he stated to be $8.70 per 1000 feet.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

MANUFACTURE—Process for the Production of Aluminum. Emilien A. O. Viel, Paris. (Brit. No. 24,612 of 1907.)

SOLDER—Aluminum-Solder. William H. Finfrock, Chicago, Ill. (U. S. No. 901,607; October 20, 1908.)

SOLDERING—Improvements in, and Relating to Soldering Aluminum and Alloys Thereof. Feodor M. Mrazsek, South Kensington, London, S. W. (Brit. No. 13,689 of 1907.)

AMMONIA AND AMMONIUM SULPHATE

MANUFACTURE AND RECOVERY—Process and Apparatus for the Manufacture and Recovery of Ammonia and Other By-Products from the Gases of Blast and Other Furnaces, Retorts, Coke Ovens and the Like. William Dunnachie, Coatbridge, Lanarkshire, Scotland. (Brit. No. 10,305 of 1907.)

ARSENIC

REDUCTION PROCESS—Improvements in the Process of Reducing Arsenical Ores. Gustaf M. Westman, New York City. (Brit. No. 3480 of 1908.)

COAL AND COKE

CAGES—Improvements Relating to Colliery and Like Pit Cages. Dixon Powner, Briggate, Leeds, Eng. (Brit. No. 1085 of 1908.)

COAL-CUTTING MACHINERY—Improvements in Machines for Cutting Coal and Other Minerals and in Apparatus and Appliances Connected Therewith. Richard H. Radford, Sheffield, Eng. (Brit. No. 6435 of 1908.)

COAL WASHING—Improvements in Apparatus for Withdrawing Sediments or Sludge from Settling Tanks Used in Coal-Washing Machinery. Communicated from Franz Meguin & Co., Actiengesellschaft, Engineering Works, Dillingen on the Saar, Germany. (Brit. No. 10,303 of 1908.)

COKE—Improvements in, or Relating to the Treatment of Coke. Charles F. R. Dunal and René Masse, Gennevilliers, Seine, France. (Brit. No. 8508 of 1908.)

COKE—Machine for Leveling Coke-Oven Charges. William B. Morgan, Lawson W. Hubbartt, and James H. Wirts, Trinidad, Colo. (U. S. No. 903,604; November 10, 1908.)

COKE-DRAWER. Robert L. Martin, Jr., and Walter W. MacFarren, Pittsburg, Penn., assignors of three-fourths to said Martin and one-fourth to said MacFarren. (U. S. No. 902,243; Oct. 27, 1908.)

COKE-OVEN OPERATION—Improvements in Removing Tar from the Hot Gases from Coke Ovens, Gas Retorts or the Like. The Otto-Hilgenstock Coke Oven Company, Ltd., Holborn, London, W. C. (Brit. No. 12,809 of 1908.)

COKE - PUSHING MACHINE. Charles Rouse and Norwell C. Neemes, Pittsburg, Penn. (U. S. No. 903,783; November 10, 1908.)

MINING MACHINE—Electric Pick Mining-Machine. Alfred Sandstrom, Chicago, Ill., assignor to John F. Bush, Chicago, Ill.

SPRINKLING-CAR FOR MINES. Peter Doney and Alexander P. Cochrane, Monongahela, Penn. (U. S. No. 902,950; November 3, 1908.)

COPPER

CONVERTER — Liquation-Furnace. Ralph Baggaley, Pittsburg, Penn., Charles M. Allen, Lo Lo, Mont., and Edward W. Lindquist, Chicago, Ill. (U. S. No. 902,047; Oct. 27, 1908.)

COPPER-LEACHING PROCESS. Frederick Laist, Butte, Mont. (U. S. No. 903,732; November 10, 1908.)

IRON AND STEEL

ALLOYS—Improvements in Steel Alloys. James Churchward, New York City. (Brit. No. 15,498 of 1907.)

ALLOYS—The Manufacture of New or Improved Alloys of Steel. Jack R. Crawford, Pasadena, Cal. (Brit. No. 21,355 of 1907.)

BRIQUETTING—Improvements in Consolidating Flue Dust, Pulverized or Finely Divided Ores or Other Materials Containing Iron or Manganese or Other Cognate Metals, into Blocks or Lumps for Use in the Manufacture of Iron or Steel. William Thomlinson, Durham, Eng. (Brit. No. 21,428 of 1907.)

DRY-AIR BLAST—Method of Drying Air. Louis Block, Mamaroneck, N. Y. (U. S. No. 903,353; November 10, 1908.)

MANUFACTURE—Process for Manufacturing Steel from Chromiferous Pig-Iron. Frank D. Carney, Steelton, Penn., assignor to the Pennsylvania Steel Company, Steelton, Penn., a Corporation of Pennsylvania. (U. S. No. 902,052; Oct. 27, 1908.)

PUDDLING FURNACES — Improvements in, and Relating to Puddling Furnaces. James P. Roe, Pottstown, Penn. (Brit. No. 5413 of 1908.)

REDUCTION PROCESS — An Improved Method of Reducing Ores, Principally Iron Ores. Karl A. F. Hiorth, Christiania, Norway. (Brit. No. 3680 of 1908.)

SLAG-LADLES—Improvements in Ladles for Carrying and Tipping Blast Furnace Slag. John H. Dewhurst, Sheffield, Eng. (Brit. No. 24,195 of 1907.)

SALT

EVAPORATION—An Apparatus for the Continuous Evaporation of Saline Solutions. Edmond Cantenot, Lons-le-Saunier, Jura, France. (Brit. No. 9868 of 1908.)

MANUFACTURE—Art of Manufacturing Salt. Pearl L. Clifton, Pomeroy, Ohio, assignor to the Pomeroy Salt Association Company, Pomeroy, Ohio, a Corporation of Ohio. (U. S. No. 903,357; November 10, 1908.)

SALT-MAKING MACHINERY. Pearl L. Clifton, Pomeroy, Ohio, assignor to the Pomeroy Salt Association Company, Pomeroy, Ohio, a Corporation of Ohio. (U. S. No. 903,358; November 10, 1908.)

ZINC

EXTRACTION PROCESS—Process of Obtaining Metallic Oxides. Richard Seiffert, Bobrek, Germany. (U. S. No. 902,260; October 27, 1908.)

PROTECTION OF WORKMEN—Means for Protecting the Operatives of Zinc and Other Analogous Furnaces from Heat, Fumes and Dust. Emile Dor-Delattre, Dorplein, Budel, Holland. (Brit. No. 15,288 of 1908.)

MINING—GENERAL

MINE GASES—Method and Apparatus for Preventing the Liberation of Fire Damp or Other Gases in Mines. Emile Lehrner, Paris. (Brit. No. 6346 of 1908.)

SKIP-DUMP. John Angove, Calumet, Mich. (U. S. No. 903,263; November 10, 1908.)

ORE DRESSING

CONCENTRATING TABLES — Head-Motion for Concentrating Tables. Samuel H. Boylan, Denver, Colo. (U. S. No. 901,585; Oct. 20, 1908.)

JIG. Robert H. Richards, Boston, Mass. (U. S. No. 901,475; Oct. 20, 1908.)

MAGNETIC SEPARATION—Improved Apparatus for Magnetic Separation of Ore. Metallurgiska Patentaktiebolaget, Centralpalatset, Stockholm, Sweden. (Brit. No. 16,780 of 1907.)

MILLS—Improvements in Mills or Apparatus for Crushing or Pulverizing Ores, Minerals and the Like. William H. Fletcher, Eikenhof, Jackson's Drift, Transvaal. (Brit. No. 5411 of 1908.)

ORE-CONCENTRATOR. Henry L. Sulman and Evan A. Sulman, London, England, assignors to Minerals Separation, Limited, London, England. (U. S. No. 902,018; Oct. 27, 1908.)

SCREENING MACHINE. George P. Burke and Peter D. Burke, Roswell, S. D. (U. S. No. 901,519; October 20, 1908.)

SEPARATION—Apparatus for Separating and Classifying Minerals. Robert H. Richards, Boston, Mass. (U. S. No. 901,474; October 20, 1908.)

METALLURGY—GENERAL

CONDENSING—Metallurgical Condenser. Woolsey M. Johnson, Hartford, Conn. (U. S. No. 902,534; October 27, 1908.)

CONDENSING — Method of Condensing Volatile Metals. Woolsey M. Johnson, Hartford, Conn. (U. S. No. 902,535; October 27, 1908.)

SLAG—Apparatus for Granulating Slag. Isaac C. Hoffman, South Chicago, Ill. (U. S. No. 902,490; October 27, 1908.)

MINING MACHINERY AND APPARATUS

DRILL-SHARPENER. Dorsey E. Gilson, Coalinga, Cal. (U. S. No. 902,146; October 27, 1908.)

DRILL SHARPENING — Apparatus for Sharpening Drills or Drill-Bits. Walter E. Kimber, Johannesburg, Transvaal. (U. S. No. 902,416; October 27, 1908.)

DRILLS—Improvements in Bits or Drills for Boring Rocks and Other Hard Substances. William Stephens, Carn Brea, Cornwall, Eng. (Brit. No. 21,586 of 1907.)

HAULAGE—A New or Improved Rope Clip for Mine Haulage and the Like Purposes. John King, Leeds, Eng. (Brit. No. 28,239 of 1907.)

MINE-CAR-HAULING DEVICE. James Rowney, East St. Louis, Ill., assignor of one-half to William Eppmeyer, East St. Louis, Ill. (U. S. No. 903,006; November 3, 1908.)

MINE-TRANSIT. William A. Berger, Boston, Mass. (U. S. No. 902,272; October 27, 1908.)

MINERS' LAMPS—Wick-Raiser for Miners' Lamps. Louis P. Eisenbeis Ottumwa, Iowa. (U. S. No. 903,064; November 3, 1908.)

MINING MACHINES—Improvements in and Relating to Electrically Driven Mining Machines. Communicated from Joseph A. Jeffrey, Columbus, Ohio. (Brit. No. 1250 of 1908.)

PICK MINING MACHINE. Edmund C. Morgan, Chicago, Ill. (U. S. No. 902,756; November 3, 1908.)

PROSPECTING-DRILL. Anton W. Johanson, Chicago, Ill. (U. S. No. 903,194; November 10, 1908.)

ROCK-DRILLING MACHINES—Improvements in Fluid-Actuated Rock-Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. No. 13,759 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

FURNACE—Smokeless Furnace. August Krippel and Freidrich Kargl, Vienna, Austria. (Brit. No. 10,701 of 1908.)

HYDROMETALLURGY—Apparatus for the Extraction of Metals from their Ores. William E. Greenawalt, Denver, Colo. (U. S. No. 901,611; Oct. 20, 1908.)

METALLURGICAL BLAST FURNACE. William S. Dempsey, New York, N. Y. (U. S. No. 900,916; Oct. 13, 1908.)

POURING APPARATUS—Improvements in Apparatus for Pouring Metal Into a Series of Molds. Aplerbecker Hütte, Brügmann, Weyland & Co., Aplerbeck i/w., Germany. (Brit. No. 4048 of 1908.)

REGENERATIVE FURNACES—Improvements in Regenerative Furnaces for Heating Metals, for Melting Metals and for Other Like Uses. Benjamin J. Hammersley, Tipton, Staffordshire, Eng., and James McChesney, Glasgow, Scotland. (Brit. No. 23,323 of 1907.)

REGENERATIVE-FURNACES — Improvements in Regenerative Furnaces. Nicolas Lébédeff and Boris Pomeranzoff, St. Petersburg, Russia. (Brit. No. 15,533 of 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. Parke Channing, of New York, has returned from Tennessee.

J. E. Spurr, of New York, left last week on a professional trip to Arizona.

Pope Yeatman, consulting engineer for the Guggenheim Exploration Company, is at Ely, Nev.

Dr. Franz Meyer will reside at Werdigen-am-Niederrhein, Germany, after the end of this year.

George C. Stone, chief engineer of the New Jersey Zinc Company, has returned from a trip to Europe.

George A. Packard, of Boston, started Nov. 22 on a professional trip to California, Nevada and Sonora, Mexico.

Dr. George W. Maynard has returned to New York, after an absence of three months in the West on professional business.

Fred J. Pope and assistants, who have spent three months examining properties in the Pachuca district, Mexico, have returned to California.

W. F. Taylor, manager of the Taylor Gold Mines Company at Magnolia, Boulder county, Colo., is making a business visit to Chicago.

Prof. E. C. Lindemann, of Boulder, Colo., has returned from an expert trip to look over oil lands in central Wyoming, with a party of British investors.

T. J. Drummond, now superintendent for the Newhouse Mines and Smelters, at Cactus, Utah, will assume the general management on Dec. 1, relieving Lafayette Hanchett.

Thomas Hoatson, managing director of the Keweenaw Copper Company, has left Michigan for the Southwest on an inspection trip of the various properties in which he is interested.

James W. Gayley has resigned his position as a vice-president of the United States Steel Corporation. Mr. Gayley's position as a metallurgist is well known; he has been the most prominent technical officer of the corporation.

Dr. Eugene Haanel, Director of Mines, Department of the Interior, Ottawa, Canada, sailed for Europe on the "Lusitania" Nov. 25. He is going to Sweden to make further investigation of methods for the electrothermic smelting of iron ore.

It is reported that Prof. Henry Mace Payne, of the University of West Virginia, has been offered the position of chief mine inspector of that State, to succeed James W. Paul, whose resignation will take effect Dec. 31. Mr. Paul has accepted a position with the United States Geological Survey.

John S. Unger, heretofore assistant manager of the Homestake Steel Works, has been placed in charge of the department of scientific research, a new bureau just established by the United States Steel Corporation. This bureau will have its headquarters at Duquesne, Penn. A. A. Corey, recently at the Donora plant, succeeds Mr. Unger at Homestead.

H. S. Denny, of London, has been in Mexico for the past month engaged in inspecting mines and studying mining conditions. In connection with G. A. Denny, who is also in Mexico, he has established a branch office of Denny Brothers in the City of Mexico. The firm will represent several foreign syndicates in Mexico, and will also act as general consulting engineers.

Obituary

Alfonso Calsado, general manager of the Compañia Carbonifera de Ciudad Porfirio Diaz, Monterey, Mexico, was drowned Nov. 8, while on a hunting trip, in a lake near the mine.

William P. Schall, who died at Bedford, Penn., Nov. 14, was a pioneer in the development of the Broad Top coal region in Pennsylvania, and was interested in several coal companies.

George Tod died at Youngstown, Ohio, Nov. 16, aged 68 years. He was active in the development of the coal industry of Ohio, and was president of the Hill Iron and Coal Company for a number of years.

William S. McKinnon died at Ashtabula, Ohio, Nov. 17, aged 56 years. He was born in Canada, but came to Ohio when a young man, and settled in Cleveland. Later he founded the McKinnon Iron Works at Ashtabula, which he managed until his death.

Joseph Bryan died in Richmond, Va., Nov. 20, aged 63 years. He was best known as a financier and newspaper owner; but he was active in the first development of the iron industry in Alabama. He was a director of the North Birmingham Land Company and the Sloss-Sheffield Steel and Iron Company.

An accident in Ellsworth mine No. 2, at Ellsworth, Penn., on Nov. 17, caused by a loose timber on a cage catching in the side of the shaft threw the men in the cage off; they fell 300 ft. and were instantly killed. The dead included J. B. Newcomer, chief mining engineer in charge of the mine; Eugene G. Smyth and M. J. Walsh, assistant mining engineers.

Walter A. Dennison, president of the American Oil Development Company, of Pittsburg, died in Brooklyn, N. Y., Nov. 5 aged 56 years. He was born in Philadelphia, and when a young man went to western Pennsylvania, where he was interested in the development of the oilfields. At one time he was a prominent independent operator there, and controlled large interests.

Alfred Marsh, a chemist, geologist and inventor, died in Detroit, Mich., Nov. 16, aged 90 years. He was born in England, but came to this country as a young man. He was for a time with the Manhattan Gas Company in New York, and while there invented a gas meter of the type now in general use. Later he was connected with several copper mines in the Lake Superior country. For many years he was chemist of the Detroit smelting works of the Detroit & Lake Superior Copper Company. He was a student of geology, and was regarded as an authority on rock formations.

Rev. Henry F. O'Reilly, who died suddenly at Shenandoah, Penn., Nov. 23, aged 73 years, was a prominent figure in the anthracite country for many years. He had been rector of the Catholic church at Shenandoah for 40 years, and was widely known and respected. At the time of the Molly Maguire troubles, 30 years ago, he did much to quiet the excitement among the miners. In the great strike of 1902-3 his influence among the miners, especially the foreign element, was exerted strongly in favor of a settlement, and he did much to assist the Anthracite Coal Commission in its labors.

Max Heberlein died recently at Mainz, Germany, aged 48 years. He was born at Braubach, Germany, and educated at Freiberg. He came to this country when a young man, about 1882, and passed a number of years in the United States and Mexico, being connected here with several plants in Montana. After returning to Germany, he went to Tasmania as general manager for the Tasmanian Smelting Company. In 1902 he went back to Germany and for several years was associated with his brother in perfecting and introducing the Huntington-Heberlein process. While so engaged he superintended the erection of plants in British Columbia and Spain. For two years past he had acted as consulting metallurgical engineer.

Societies and Technical Schools

Lehigh University—At this institution Bethlehem, Penn., Floyd W. Parsons, associate editor of the ENGINEERING AND MINING JOURNAL, on Nov. 20, delivered a lecture on coal mining before the students. The lecture was illustrated by a number of lantern slides.

Mining and Metallurgical Society—The New York section held its regular monthly meeting at the Engineers' Club, on Nov. 19. After an informal dinner, discussion of the question, "What information should a mining company include in its report to be fair with its stockholders," was resumed. The meeting was well attended. The Philadelphia section held its organization meeting on Nov. 20. The San Francisco section has also had its organization meeting.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte and Goldfield, Mexico and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 19—Several miners near Bodfish, in Kern county, one of whom has a small mill on his mine, are after the Kern River Power Development Company, for encroaching on their properties. The power company, in making applications for patents in that section, has, it is alleged, moved the monuments on the old mining claims to one side. The miners also claim that the advertising notices are worded with intent to deceive and are about to contest the applications for patent made by the power company. Some of these mining claims were located as far back as 1895 and regular assessment work has been done upon them.

It is evident that some large company is about to take hold of the gravel mines in the Sierra county region about Slate Creek, Scales Diggings and Port Wine. There is supposed to be a deep rich gravel channel running through that section, being a continuation of the Alleghany channel. Several mining engineers of standing have been examining different properties in that section and getting at the facts connected with them. The region needs capital for extensive development, as most of the mines must be drifted and this means long and expensive tunnels before the pay gravel may be reached.

Near Big Oak Flat in Tuolumne county the Santa Ana Mining Company has built a 300,000 gal. reservoir, supplied from the Golden Rock ditch, the water to be used in ground-sluicing the surface of the Eureka and Mississippi quartz mines. A number of blanket veins and shoots of rich ore have already been found. In addition to the ground-sluice a hydraulic giant will also be used in washing away the surface.

Wallace, Idaho

Nov. 18—The greatest activity has prevailed all through the different towns of the Cœur d'Alene in connection with the report that there is an organized attempt on foot to have the tariff on lead and zinc ores reduced when that matter comes before the congressional committee on tariff revision at Washington, D. C. In connection with this report mass meetings were held in Murray, Burke, Wallace, Wardner, Kellogg and practically every other center in the district. At each of these meetings delegates were appointd to a grand conference held in Wallace yesterday, at which the following committee was appointed to attend the deliberations of the congressional committee: W. Clayton Miller, manager, Federal Mining and Smelting Company; Al Page, of Wardner; D. E. Keys, of Mullan; Herman J. Rossi, of Wallace, and William J. Brand, of Mace. Petitions have been circulated protesting against any attempt to reduce the tariff, and the committee from the Cœur d'Alene has been instructed to cooperate with Senator W. B. Heyburn, Senator Borah, if possible, and with all other districts which will be represented at the meeting.

Goldfield, Nevada

Nov. 17—T. B. Rickey, the indicted president of the defunct State Bank and Trust Company, while passing through Reno, on his way to San Francisco from Independence, Cal., where he was defendant in a suit to recover a large block of Keane Wonder stock, was served on the train with papers in a suit for an accounting of the State Bank funds amounting to $1,062,000. At the recent election a new district attorney was elected, the new incumbent being pledged to bring Rickey to trial.

Arthur Winslow, of Boston, president of the Liberty Bell Mining Company, of Telluride, Colo., has been at Goldfield this week looking over the situation generally and the Consolidated in particular. Mr. Winslow was the first president of the Combination Mines Company, whose property was put into the Consolidated at a valuation of $4,000,000. Those formerly interested in the Combination are represented on the board of directors of the Consolidated company by J. T. Hubbard, of Chicago, who visited the camp recently. The visits of large stockholders at this time just prior to the annual meeting and the quiet, but aggressive, soliciting of proxies by two different influential interests portends interesting developments at the meeting. It is confidently asserted by some that Bernard Baruch, of New York, and Mr. Hayden, of Hayden & Stone, of Boston, will be elected directors.

The steel work of the Consolidated mill is now all in place and the putting-on of the corrugated sheeting will soon be finished, but only the most optimistic believe that the mill will start before the early part of next year.

After a lapse of five years, during which the plant of the Boston Electrolytic Refining Company, a copper-lead smelter one mile east of Reno, will soon begin operations. It has been leased under option to the Nevada Commonwealth mines. This remodeled smelter will be the first plant in the State to make a specialty of zinc ores. The Commonwealth ore contains large percentages of both zinc and arsenic; both will be recovered, for the smelter will be run as a zinc-arsenic-lead plant rather than a copper smelter. The electrolytic copper-refining department will be run to treat the copper furnished by the copper plant at Carson City.

The Engineers lease has just declared a dividend amounting to $180,000. In some respects this is the most remarkable lease in the history of the camp. Ninety per cent. of the lease stock is held by three mining engineers. Work was started May 8, 1908. The owners were "strapped," the lease in debt for labor and machinery, and the engineers about to quit when ore was found June 15. Two days later the first shipment was made. In just four months of production $1,100,000 was extracted. The lease expired Nov. 8, but another dividend will be paid from the final cleanup.

Salt Lake City

Nov. 21—To voice their protest against any reduction in the tariff on lead, a mass meeting of Utah mine owners last night chose O. E. Loose, of Provo, and C. E. Allen, of Salt Lake, to appear as delegates before the Ways and Means Committee at Washington. The meeting was held under the auspices of the Utah Mine Owners' Association. The circulation of a petition to be signed against the reduction of duty was authorized by the meeting.

Butte

Nov. 19—After the conference between the coal operators and the miners of Montana at Helena two weeks ago, it was thought that the troubles at the Spring Creek and Roundup mines had been finally settled. The miners, however, refused to accept the agreement made by their representatives and went out on a strike the early part of this week. Just what action will be taken by the operators is not yet known.

The motion for the appointment of a receiver for the North Butte Extension Copper Mining Company is still pending in the United States District Court. A number of conferences have been held between the attorneys for the company and the various local creditors. The action for the appointment of a receiver was brought chiefly for the purpose of keeping the company from transferring its property to the newly organized North Butte Extension Copper Development Company, and

was in the interests of the stockholders of the old company. The creditors strongly oppose the idea of a receiver and take the position that they will not receive payment any sooner by such methods. They threaten to bring other proceedings unless their claims are settled within a short time.

Kelly, New Mexico

Nov. 18—Considerable mining is being done in Socorro county, in the Kelly and the Magdalena districts. The Kelly mine is being worked by the Tri-Bullion company, for which R. W. Bull, of Kelly, is manager. The usual amount of development work is being done, and considerable ore is being shipped. The Key and Tip Top group of claims to the east of the Kelly mine and higher in the Magdalena mountains is being worked steadily. The ore bins are filled with ore of good grade, while a large tonnage of ore lies broken in the stopes. It is supposed that this group of mines, which is being worked by the Boston Development Company, will probably resume shipments in the near future. C. T. Brown, of Socorro, is manager. Mr. Brown is also developing two other promising properties, the Alhambra and the Germany Tunnel, both near the Kelly mine, and is also mining zinc and lead carbonates from his lease in the upper workings of the Kelly mine.

At the Graphic group, owned by the Ozark Mining and Smelting Company, considerable ore is developed. In the upper workings there are large stopes of lead and zinc carbonates while in the workings from the Waldo adit considerable sulphide ore containing zinc, lead and copper has been developed. Joseph Brown, of Kelly, is manager.

Simeon Exter is mining some good ore, containing lead and copper, from his lease on the Young America mine. At the Cavern and Grand Ledge mines, where the ore contains copper, lead and gold, development is going steadily ahead under the management of B. A. Stattz of Albuquerque. At the mines of the Mistletoe Mining Company and the Magdalena Tunnel Company, which are both operated under the management of W. F. Gordon, of Kelly, considerable good ore containing lead and zinc has been developed. As a result the companies are considering the building of a mill to treat the ore. At the Success group of claims controlled by John Hill, of Kelly, the 400 ft. of development work has opened up considerable good ore. William Martin, has the Stone Wall mine under lease and is shipping high-grade zinc, lead and gold ores. The Hardscrabble Extension which is being developed by the Copper Ridge Mining Company is about to begin shipping. The ore carries gold and copper. George Keith of Magdalena is in charge of the mine.

The Keystone & Barrister group of claims, two miles northeast of Magdalena in the Magdalena basin, has developed quite a large reserve of free-milling gold ore. A 10-stamp mill has been ordered. P. A. McMahan, of Magdalena, is in charge. Considerable work is also being done at the Burton and the Russell groups in Magdalena basin. This development work under the direction of Wayne Russell, of Magdalena, has opened up considerable ore carrying lead, copper and gold.

At the Silver Line group of claims in Magdalena basin a well defined vein, 9 ft. wide, has been opened up. The ore contains considerable vanadium combined with lead, copper and silver. Beautiful crystals of vanadanite occur in the ore. A. L. Heister, of Kelly, is in charge of this property. Considerable free-milling gold ore has been developed at the Carbonate and Last Chance properties in Magdalena basin. H. F. Brittenstein, of Magdalena, is in charge of these two mines.

Denver

Nov. 20—On the ground that any further reduction in the price of lead will force many of the mines in Colorado to close down, the American Smelting and Refining Company will join with the commercial organizations of Denver in fighting any effort on the part of the next Congress to reduce the import duty on that metal. The first step in the campaign against such a reduction was taken yesterday, when the Colorado Manufacturers' Association, through its board of directors, addressed a telegram to Sereno E. Payne, chairman of the Ways and Means Committee of the House of Representatives, protesting against any lowering of the tariff on lead. Other Denver commercial organizations are expected to take similar action.

At Lake City, an important strike of copper ore is reported. The orebody is said to be 11 ft. in width, and to run 35 per cent. in copper and over 50 oz. silver to the ton. It is being shipped out *via* Silverton.

In the Cripple Creek district, the Acacia company's miners broke through into the Findley workings, which latter had passed beyond its territory from 12 to 49 ft., and taken out a stope from 4 to 15 ft. wide and 50 ft. high, in Acacia ground. The manager of the Findley company has offered to settle for ore extracted, and the matter will be amicably arranged.

It is now almost certain that the Union Pacific will build from Wamsutter, on its main line in Wyoming, to Craig, on the projected line of the Denver, Northwestern & Pacific, or Moffat road. Craig is in the center of the Yampa coalfield, in Routt county, and the coal, of course, is the object of the incursion of the Union Pacific into this territory. Craig is about 40 miles west of Steamboat Springs, to which point the Moffat road will be running trains next month.

A great deal of nonsense is being published in the local papers about the Royal Flush mine at Hahn's Peak, north of Steamboat Springs. Those interested would do well to read a description of this property by a special correspondent in the JOURNAL of Oct. 24 last.

Calumet, Michigan

Nov. 20—Plans are about consummated for the consolidation of the Franklin Jr., Rhode Island and a section of land now owned by the St. Mary's Mineral Land Company. At a meeting of the Franklin stockholders to be held at Boston on Dec. 22, 1908, definite arrangements will be made. It is proposed to increase the capitalization of the Franklin property from 100,000 shares to 200,000, to sell a portion of its lands upon which the old workings were opened and also the millsite on the shore of Portage lake. The proposed company will start with an issue of 150,000 shares and will have about $400,000 and 50,000 shares in the treasury. It will control about four square miles of land in the heart of the Houghton county mineral zone, containing an extension of about 14,000 ft. on the Pewabic lode, which is to be the main working lode. The Pewabic lode is being opened up at the Franklin Jr. property by crosscuts and at the 23rd level it is exceedingly rich, indicative of the good results that are to be expected with depth. The crosscut from the 24th level is just coming into ground in close proximity to the lode.

Toronto

Nov. 20—J. B. Tyrrell, mining engineer, for many years connected with the Canadian Geological Survey, has returned to Toronto after an extended trip through the Montreal river mining district, which is now attracting much attention on account of the numerous flotations of new mining companies. Speaking of the prospects of the district generally, Mr. Tyrrell said that the noticeable feature was the great extent over which silver-bearing veins are distributed. There was silver everywhere awaiting development, but the public should not expect a repetition of Cobalt experiences, as it was not at all likely that development would pay for itself as in many of the Cobalt mines; plants must be built and much money must be expended before returns can be looked for.

S. Bennett, a trusted employee of the O'Brien mine, was tried at Cobalt, Nov. 17, for stealing 320 lb. of ore, nearly all silver nuggets; on being found guilty he received a sentence of 8 months' imprisonment.

A rich discovery of copper is reported in the Port Arthur district. The deposit, which is said to extend for miles, is near Flor island, off Isle St. Ignace, at the entrance to Nipegon strait. It was discovered by Didace Carufel, of Sudbury, and 17 claims have been taken up by Carufel and his associates.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Alabama Consolidated—This company has installed a Covington coke-drawing machine in its coke plant at Brookwood.

Birmingham Coal and Iron Company—This company has installed two Covington coke drawers and loaders at its No. 2 coke plant at Short Creek.

Tennessee Coal, Iron and Railroad Company—Mine No. 3 of this company, between Ensley and Pratt City, was set on fire Nov. 16. The fire started about 50 feet. down the manway from the mouth of the slope. The mine is worked by convicts, nearly all negroes, and it is believed that a gang of these convicts started a small fire in the slope to call the attention of the guards and cover an attempt to escape. The fire, however, extended to the slope timbers and got beyond control, with the result that some 60 men were shut up in the mine. The rescue parties had much difficulty in entering and getting the fire under control. The result was that 10 men were suffocated and a number of others are missing, and are believed to be still in the mine.

Arizona

GRAHAM COUNTY

Arizona Copper—This company's production for October amounted to 1451 tons of copper.

California

ALPINE COUNTY

Welcome Mining Company—This company, owning 33 claims near Markleville, C. N. Diller, manager, has found some ore of high grade. Most of the stockholders in this company are residents of Sacramento.

AMADOR COUNTY

Clinton Consolidated—This old mine at Wieland, at one time a good producer, is to be started up again, this time by people from Scotland. It has been closed down since 1893. The Edinburgh group of mines at the same place is again at work, and $20-ore is being mined.

Garibaldi—In the orchard of J. Garibaldi, near Volcano, he has found gravel yielding high in gold, close to the surface. The Volcano ditch runs close to the property, and the gravel will be ground-sluiced.

BUTTE COUNTY

Bader—This old gravel property on the Magalia ridge, has been bonded by A. E. Smith.

CALAVERAS COUNTY

Angels—With few exceptions all the large and smaller mines at this important camp are closed down on account of lack of water, and rains are anxiously expected.

Eastland-Gray—This drift mine on the Calaveras river has been bonded for a short time to S. R. Fox and associates, who will prospect it with a view of dredging the ground.

EL DORADO COUNTY

Prevolcanic Channel—The large gravel crusher at this mine, near Pacific, 16 miles from Placerville, has been started up. About 150 tons of gravel daily will be crushed.

FRESNO COUNTY

Arrangements are being made for more extensive operations by the Fresno Copper Mines, Ltd., near Clovis. A contract has been let to a Los Angeles firm to build a railroad about four miles long from the Pollasky branch of the Southern Pacific to a connection with the north end of the copper company's existing tracks at its mine. The hauling of ore is now being done by team, and this ore has to be handled twice. With the new branch completed, as it will be shortly, the teaming will be done away with and the ore handled by rail. The Fresno copper mine is owned by a Glasgow, Scotland, company, and the ore is shipped to smelters in the State of Washington for reduction.

INYO COUNTY

Britain—In this mine, at Beveridge, the Spear Brothers, of Lone Pine, are drifting on an oreshoot, trying to determine its extent. The ore is of high grade.

Casa Diablo—The ore being milled at this mine is a mixture from three veins, and is giving good results. The winze below the tunnel is to be extended to a depth of 500 ft. Ten stamps are to be added to the mill, which already has 10 stamps.

MARIPOSA COUNTY

Roosevelt No. 2—This mine on the Mt. Gaines lode, at Hornitos, owned by Taylor, Longe & Stierwalt, is showing up high-grade ore in the new strike.

MONO COUNTY

Wolverine—This mine, owned by A. Bryant, of Bridgeport, adjoins the Parrott group, and has been leased by two Italians, who have recently opened up some good orebodies.

SHASTA COUNTY

Sybil Gold Mining Company—This property, French Gulch district, G. A. Von Kruze, manager, is yielding ore of a satisfactory grade.

SISKIYOU COUNTY

Highland—This company, at China gulch, has started up its mill.

Hardscrabble—This mine, on French creek, owned by Charles Parrott, is again being worked and its mill has been started up.

TEHAMA COUNTY

Tom Head Copper Company—In the lower tunnel 18-per cent. copper ore has been encountered, carrying some gold, also. The vein is much wider than where found on the surface.

TRINITY COUNTY

Bonanza King—At this mine, six miles from Trinity Center, crews are being engaged for continuing work during the winter. A new tunnel is being run on the property.

TUOLUMNE COUNTY

Draper—Operations have been resumed at this property under superintendency of R. A. Nichols.

Gem—This mine, five miles from Confidence, under bond to Addis, Scott & Holland, has been started up.

Colorado

BOULDER COUNTY

Boulder County Mines—Deeds have been filed for record conveying from C. F. Lake, of Boulder, Colo. and T. N. Barnsdall, of Pittsburg, Penn., to the Primos Mining Company, several mines for $100,000. The mines are situated in the Cardinal and Nederland tungsten sections and the Primos company is an auxiliary company to the Primos Chemical Company, which markets the major portion of the tungsten concentrates from Boulder county.

Consolidated Copper Mining Company—Work has been suspended at this mine at the base of Arapahoe peak for the winter, but the company will build a concentrating mill and power plant next spring. Main office is located in Boulder.

Eagle Rock Mill—This mill has been leased by Lincoln, Neb., and Denver men, is being overhauled and improved machinery is being installed for the purpose of handling tungsten custom ores.

Zopher—Boston men are interested in the taking over of the Wood Mountain property at Wall Street, with J. B. Annear, Wall Street, Colo., in charge of the operations. The company intends to remodel the mill.

CLEAR CREEK COUNTY

Continental Mines, Power and Reduction Company—The power plant of this company on Fall river is to be increased by the addition of another unit of 720 h.p. and it is reported that the company will erect another power plant next season. Henry I. Seemann, Equitable building, Denver, Colo., is manager.

Conqueror—Machinery is being installed and plans have been made for heavy development. W. S. Prior, Empire, Colo., has been re-elected president and general manager.

Knickerbocker—Eastern and Idaho Springs men have become interested in a lease and bond on the Sprankle group in Empire district and William E. Hogel, of Idaho Springs, Colo., is manager. Machinery is to be installed and electric power will be used.

Memphis-Tennessee—New machinery is being hauled to the mine for installation. Charles Fuller, Idaho Springs, is in charge.

LAKE COUNTY—LEADVILLE

Canterbury—This mine, on the hill of the same name, has been under lease to local miners and worked steadily for the past few months with the result that a small vein of ore was opened recently that carries gold and silver. This is the first time that gold to any amount has been found in any vein on the hill.

Coronado—With the opening of the new orebody several hundred feet from the shaft, the air became so bad that it was impossible to work it, therefore the lessees were compelled to drive an air shaft.

Iron Silver—A small force of men has been put to work on the Tucson, North and South Moyers, to clean out the different drifts and make the necessary repairs on the shafts, preparatory to starting the properties up with a full force.

Ontario—O. P. DeFord and Myron Marsh, W. Va., are financing this property, Twin Lakes, and have asked for bids for sinking the shaft and driving the tunnel; the contracts will be let and work will be carried on during the winter.

PITKIN COUNTY

Smuggler—It is reported that this company is about to resume work on the the Free Silver shaft near Aspen. The shaft is to be unwatered and sunk 200 ft.; possibly a tunnel will be driven also.

SAN JUAN COUNTY

Gold King—All damage done by fire last June to this mine at Silverton has been repaired. The mine is now fully at work, and 70 stamps are in use at the mill.

Idaho

SHOSHONE COUNTY

Hecla—The following officers and directors were elected at the postponed annual meeting, held in Spokane last week: President, Frank Upman, of Chicago; vice-president, W. J. C. Wakefield, of Spokane; secretary-treasurer and manager, James H. McCarthy, of Wallace; assistant treasurer, F. F. Johnson, of Wallace; directors, S. E. Smith, of Chicago; Carl Landsee and F. J. Klipp, of Milwaukee, and Henry Ulick, of Youngstown, Ohio. Mr. Upman succeeds James R. Smith, deceased, and Mr. Wakefield succeeds A. B. Campbell, of Spokane.

Butte & Coeur d'Alene—At a meeting of the stockholders, at Mullan, it was decided to install a quantity of machinery at once. The contract for the treatment of the ore by the Panhandle smelter was also closed up. This is the property on which a strike was made recently.

Charles Dickens—The Idaho-Knickerbocker Mines Company has been formed for the purpose of acquiring the Charles Dickens mine; all of the stock in the new company, with the exception of 50 shares, has been subscribed for by A. D. Gritman. Mr. Gritman has forwarded a notice to each of the stockholders of the Charles Dickens company offering them the same number of shares in the Knickerbocker company as they hold in the Charles Dickens company in consideration of a payment at the rate of 7c. a share and the surrender of their stock in the Charles Dickens company.

Indiana

CLAY COUNTY

Crawford Coal Mining Company—Nine miners employed at mine No. 9 of this company have been discharged for loading dirty coal. The matter has been referred to President Golden, of the block-coal miners, who take the position that the men loaded only as much fireclay as was needed in shooting the kiln. Trouble is anticipated.

SULLIVAN COUNTY

A heavy passenger train on the Indiana Southern Railroad while crossing the undermined area of the Dugger or Vandalia Mine No. 30 caused the surface and track to subside for a space of 60 ft. The speed of the train carried it over and averted an accident. The rooms below the track were thought to be securely timbered, but it will require considerable time and expense to repair the mine and track.

VIGO COUNTY

Since Governor Hanley has ruled that the law permitted use of larger bits in mining the differences in the coalfields between the miners and operators will likely be settled soon.

Tentative negotiations for the settlement of the Hudson mine case by the operators' and miners' officials of this district have been stopped. The mine remains idle because of a difference of $17.50 wages alleged to be due a mule driver who was discharged, and refusal to reinstate him precipitated a walk out.

Iowa

Bear Creek Coal and Mining Company—This new company has secured coal rights on about 30,000 acres of land in Dallas, Boone, Polk and Marion counties. Provings are being made with a view to proving the coal and indicating the best places to sink shafts. The office of the company is at Des Moines, Iowa. The officers are: President, A. E. Hollingsworth; vice-president, J. H. Polk; treasurer, George B. Hippee; secretary, A. P. Chamberlain.

Michigan

COPPER

Copper Range—At the Globe shaft, held under option by this company, drifting continues both ways from the 1000-ft. level; copper-bearing rock appears from time to time, but nothing of a permanent nature has yet been exposed. A diamond drill has been started from this point and a hole will be driven on the pitch of the formation for a considerable distance to ascertain its value at depth. At the first level, a distance of 356 ft. from surface, a crosscut has been started to cut the formation. In sinking this shaft the stations were cut at the various proposed levels, it being the intention to begin crosscutting to the lode simultaneously when the lode appeared in the shaft; the shaft is vertical and is being sunk in the hanging wall, but, owing to the disappointing showing at its intersection, these plans have been modified.

Adventure—Diamond drilling continues at this property, two outfits being in service to check and to obtain additional data regarding the rich formation that was penetrated by a drill core some time ago.

Wyandot—On the crosscut that this company is driving eastward from the 700-ft level of its exploratory shaft an amygdaloid formation was cut carrying a rich seam of copper-bearing rock. Drifting will start on this as soon as the crosscut has been extended far enough to allow the full value to be determined.

Ojibway—No. 2 shaft has just entered the lode in the crosscut being driven from the second, or 500-ft. level. The station at No. 1 shaft disclosed the lode highly

mineralized, and the crosscut showed it to be about 20 ft. wide and well charged throughout. This crosscut will be extended farther to open the other beds of the series. Sinking is in progress at both shafts, and levels will be established at intervals of 150 ft. hereafter.

Quincy—Sinking will be resumed shortly at No. 9, or Pontiac shaft, which was temporarily suspended while a concrete collar was being put in. The shaft is bottomed at a depth of 200 ft. from the surface, and a good grade of rock has been in evidence throughout its length.

Missouri

ZINC-LEAD DISTRICT

American Zinc, Lead and Smelting Company—This company has started up its No. 4 plant at Prosperity, after a long shutdown.

Empire Zinc Company—This company is preparing to resume operations at its Carbonate mine near West Plains in Howell county. Capt. Dwyer, of Joplin, is manager.

Kathleen—This company at Zincite has installed a 5-in. centrifugal pump to drain the old ground and will begin operations at once. Frank B. Wilcox, of Joplin, is manager.

Merry Widow—This company has made five good strikes out of nine drill-holes on its lease of the Kalitan mine on Turkey creek.

Midway—A. W. Grannis has leased 30 acres of the Weyman land at Midway. He has installed a 6-in. two-stage centrifugal pump and will operate the old mines.

Sunrise—This company at Spring City is planning to run its hand-jig tailings through the new mill. To get them to the mill the plan devised is to drop them through a drill-hole into cans in the mine, and then hoist the cans of tailings to the hopper at the mill.

Montana

BUTTE DISTRICT

North Butte—The south branch of the Edith May vein has been cut in a crosscut running north from the station on the 2000-ft. level, and 20 ft. of 5-per cent. ore has been encountered. Drifting has progressed a distance of 125 ft. The north crosscut will be continued to cut the Jessie vein, which is between 800 and 900 ft. north of the Edith May vein. On the same level a crosscut has been started south to cut the old Speculator ledge.

Butte-Coalition—At the Tramway mine the station on the 1600-ft. level has been completed and a crosscut started northward to open up the Minnie Healy ground on that level. Through the Tramway shaft the Minnie Healy ground on the 1300-, 1400- and 1500-ft. levels is being developed rapidly and large bodies of ore of good grade have been exposed. The entire surface plant of the Minnie Healy mine has been dismantled and the gallows frame has been taken down and will be hauled away.

Sunday Placer—H. K. Welch has conveyed to James Gillie and others an undivided 56/176 interest in the Sunday placer claim, also an undivided 8/11 interest in the July, June and Wolcott placers. The claims lie near Rocker, five miles west of Butte and just south of the claims of the British-Butte company.

CARBON COUNTY

Northwestern Improvement Company—A fire, which started Nov. 20, from a miner's light in the second drift, east from the No. 2 slope of the company's coal mines at Red Lodge, has already caused the death of six miners and probably of many more, 20 miners being still entombed with faint chance for rescue. Judging from the immense volume of smoke and fire emitted from the second entry, the fire must have advanced over a large area. Iron pipes have been laid into the mines and a flow of water has been turned on the flame. The company is controlled by the officers of the Northern Pacific Railroad and supplies that road with fuel.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Both the ore-purchasing companies continued to refuse to state the tonnage being treated or handled by them. During the week ending Nov. 14 the total production of the camp probably was not more than $100,000. The Chlorination mill treated 225 tons of an average value of $60 per ton. The Combination mill treated 630 tons of an average value of $40 per ton.

Clermont—At the new Clermont shaft of the Consolidated, owing to the breaking of a pinion in the hoisting gear, a bucket of ore weighing nearly a ton fell from the collar to the bottom, a distance of 650 ft. One man was killed and another seriously injured.

Florence—The water supply for the new Florence mine is to be obtained from Indian Springs, six miles west of Goldfield. The water main is a wooden pipe, which has proved unable to carry the pressure; two miles of this wooden pipe is being replaced by iron pipe.

Florence Consolidated—The last car of ore shipped averaged $85 per ton. The raise from the intermediate level between the 300- and the 173-ft. level is in high-grade shipping ore. The north drift on this level is in ore of fair grade. On the 300-ft. level a drift is being driven to cut the payshoot which is producing shipping ore in the upper levels.

Consolidated Red Top—This lease has declared its first dividend of 2c. per share.

Mohawk Jumbo—This lease has announced its fourth dividend amounting to 3c. per share. The MacMillan Holleran Company, which promoted the lease, has dissolved by mutual consent.

Jumbo Lease—A dike carrying sulphide ore of fair grade has been cut at a depth of 360 ft. in the Jumbo lease just beyond the Zinn workings. The control in the lease is owned by W. H. Clark, of Salt Lake City.

Mitchell-Fairfield Lease—Low-grade ore is exposed in the 310-, 400- and 500-ft. levels. A new vein, fairly wide, has been cut on the lowest level in the south crosscut, 26 ft. from the shaft. The crosscut has penetrated the vein 7 ft.; the vein is hardening as the hanging wall is approached. In five months this lease has sunk a two-compartment shaft 520 ft. deep, and has done 625 ft. of lateral work.

St. Ives Leasing Company—Enough ore to make a shipment is sacked at the St. Ives mine. This comes from the 50-ft. level.

Goldfield Consolidated—The Kinkead mill which has been used to evolve and perfect the Hutchinson process for the treatment of sulphide conentrates to make them adaptable to cyanidation has been shut down. No more concentrates will be treated until the new plant on Columbia mountain is completed.

Gold Button—A contract has been let to sink 200 ft. This property is located on the easterly slope of Vindicator mountain in a hitherto-little-prospected portion of the camp.

Combination Extension—The southwest crosscut has now been driven 1200 ft., and while stringers giving high assays have been cut, no commercial ore has been found. Therefore for the present prospecting will be confined to the section north of the shaft where two raises are being driven and a crosscut has been started to the west. If no ore is found, the shaft will be sunk several hundred feet deeper. Preparations have already been made for sinking the shaft.

Florence Annex No. 2—This lease has taken out about 10 tons of ore from the 150-ft. level, where a 20-in. streak averages $60 per ton. The shaft is now 350 ft. deep; crosscuts will be driven to the ore from that level.

Consolidated Red Top—In No. 2 south raise from the 225-ft. level there has been found a streak of ore, 7 in. wide, which assays per ton 42.1 oz. gold, 34.5 oz. silver, 5 per cent. copper and 12.5 per cent. lead. Heretofore lead has been unknown in this camp.

Little Florence—The three-compartment shaft on this lease, which covers the southern three-fifths of the Combination Fraction claim, is 545 ft. deep; the station on the 520-ft. level is completed. All the company's workings are now connected.

Black Butte Bonanza—After a brief shut-down, work has been resumed, and

35 tons, averaging $55 per ton, has been shipped this week.

ESMERALDA COUNTY—RAWHIDE

Rawhide Coalition-Rawhide Queen—Although as yet unconfirmed officially, it is practically admitted that a merger of these two companies has been effected by Philadelphia men who have also secured control of the railroad being built to Rawhide from Shurz on the Southern Pacific system.

Rawhide Mining and Reduction Company—The 10-stamp mill for this company has been shipped from the Allis-Chalmers Company's Milwaukee plant.

Rawhide Coalition—The Grutt-Hard lease has just shipped 15 tons of ore to the sampler at Hazen; the ore averaged $300 per ton.

Wright-Price Lease—A hoist has been installed and shaft sinking has been resumed. On the 150-ft. level drifts will be run to cut the vein exposed at surface.

HUMBOLDT COUNTY—CHAFEY

Black Hole Mine—E. S. Chafey and W. M. Sims have made the last payment on the Black Hole mine to Mrs. Floyd and Mrs. Hendra, the former owners. The purchase price was $30,000. Many times this amount has been realized from ore shipped from the property since it was bonded a few months ago.

Gee Whig No. 1—In a lease on this claim a vein of galena 8 to 16 in. wide has been found. The vein is widening with depth.

NYE COUNTY—BULLFROG

Keane Wonder—A gold brick weighing 560 oz., obtained from a 10-day run in the mill, has been sent to the Mint. The October production will be above $15,000. A cyanide plant to treat the tailings dump, which contained about 14,000 tons, will be installed.

Montgomery-Shoshone—The recent report of the bullion tax collection for the first six months of 1908 shows that this company was the second-largest producer; the Tonopah Mining Company was the largest producer.

Homestake—The first clean-up at the Homestake-King mill under the new management yielded a brick worth about $10,000. While this was not a complete clean-up, it represented practically all of the October run, or 1200 tons of ore.

NYE COUNTY—MANHATTAN

Thanksgiving—Gilbert Ross, of Tonopah, has taken an 18-months' lease on the Thanksgiving property, under the terms of which he gets the use of the present mining equipment, but is to sink the shaft, now 350 ft. deep, to a depth of 550 ft. The Thanksgiving has just closed a contract for the milling of 1000 tons of ore at the Canyon mill, which is now under new management.

CHURCHILL COUNTY—FAIRVIEW

Nevada Hills—It is authoritatively announced that the sixth dividend of $75,000 will soon be paid, making a total of $450,000 since the organization of the company two years ago. Prior to Jan. 1, 1908, the Nevada Hills property had shipped to the Salt Lake smelters 4053 tons of ore, for which it received in settlement $533,480 net, equivalent to $132.63 per ton. This is a remarkable record for consecutive high-grade shipments.

HUMBOLDT COUNTY—CHAFEY

Black Hole—The pipe-line, 2500 ft. long, has been completed; the boiler and hoisting plant are installed, but the headframe is not completed as yet.

HUMBOLDT COUNTY—SEVEN TROUGHS

Seven Troughs Coalition—The Seven Troughs, Therein, Kindergarten and Red Cloud properties have been consolidated into a new company known as the Seven Troughs Coalition Mines Company.

NYE COUNTY—TONOPAH

Production for the week ending Nov. 7 amounted to 5318 tons of ore valued at $137,025. The Tonopah Mining Company mined 3300 tons; Belmont, 650; Montana-Tonopah, 623; Midway, 100; MacNamara, 350; West End, 100; Jim Butler, 250; Tonopah Extension, 45 tons.

Montana Tonopah—Repairs to the tube mills have been completed and the amount of ore treated is again normal, being about 1000 tons per week. The diamond-drill hole from the 750-ft. level has made slow progress, owing to the crumbling nature of the rock. The hole is now 130 ft. deep.

Tonopah Mining Company—During the week, 433 ft. of new ground was broken, 161 ft. in the Silver Top claim and the balance in the Mizpah and Red Plume. The diamond-drill hole from the 740-ft. level of the Silver Top mine has reached a depth of 61 ft. It is the intention to sink this hole 1000 feet.

Tonopah Belmont—The orebody on the 1100-ft. level is being developed as rapidly as possible. Where this vein was first crosscut it showed a width of 38 ft. between walls, the larger portion of this width being of milling grade. Since then the east drift has followed the foot-wall side for 90 ft. The north crosscut from the winze on the 1100-ft. level has exposed two orebodies, one 3 ft. wide and the other 6 ft. wide, separated by 8 ft. of vein matter which carries bunches of ore. Drifts are now being driven along these two deposits, both faces showing good ore.

WHITE PINE COUNTY

Giroux—The concentrating mill has been put in operation and running two shifts is treating about 400 tons per day.

New Jersey

WARREN COUNTY

Work on the copper mine near the Delaware river in Pahaquarry township has been suspended. The men employed have been discharged, only a watchman remaining at the mine. The cause is not known.

New Mexico

LINCOLN COUNTY

Eagle Mining and Milling Company—Six of the Huntingtons at the mill at Parsons are running; 35 men are working at the mine.

Oklahoma

MARION COUNTY

Golden Hen—This company is moving a mill from Joplin to its mine at Miami.

Willow Branch—J. W. Barnes has struck high-grade ore at 108 ft. in a shaft on the Willow Branch lease at Miami. This is the first deep ore developed in that camp.

Pennsylvania

ANTHRACITE COAL

The shortage of water in the anthracite region, a result of the long drought, is embarrassing the operation of many collieries. The Lehigh Valley company is hauling water from White Haven 30 miles to keep the collieries in the Shenandoah district at work. The Reading Company is putting down nine artesian wells near Mahanoy City. These wells, however, will hardly be available in the present crisis; but they will provide against a repetition of the trouble.

There has been much discussion lately over the dangers of surface caving over coal workings in the anthracite district. A call has been issued for a conference to be held in Scranton, Dec. 1, at which mayors and burgesses of the cities and principal boroughs of Luzerne, Lackawanna, Schuylkill, Northumberland and Columbia counties are expected to attend. The object of the meeting is to devise some measures of protection against caving, and to appeal to the Pennsylvania legislature for the passage of some effective measure to insure safety.

BITUMINOUS COAL

J. V. Thompson, of Uniontown, Penn., has purchased 2500 acres of land in Greene county from James Evans, of McKeesport. The tract lies along Whitely creek, abutting upon the line of the proposed Wheeling shortline. The drillings show the coal to be 8 to 9 ft. thick, 350 to 450 ft. deep, and to be of high grade. This coal is south and to the east of the holdings of the H. C. Frick Coke Company, in Monongalia and Greene townships, and almost immediately south of the tracts purchased by James A. Campbell, the Youngstown Sheet and Tube Company interests, and the Andrews & Hitchcock Iron Company.

Options on coal land in Armstrong and Indiana counties are being taken by interests said to be friendly to the Erie, the Buffalo & Susquehanna and the Buffalo, Rochester & Pittsburg railroad companies. Agents have been working in that section for the past eight months. This is the first move on the part of the interests representing the Erie railroad since the 21-year trackage agreement was made with the Buffalo, Rochester & Pittsburg. On account of the competition among the three companies, owners of the coal property are asking fancy prices.

Puritan Coal Company—This company and the Stineman Coal Company, operating in Cambria county, have begun suit against the Pennsylvania Railroad Company to recover some $340,000 damages for injury done to their business by alleged discrimination in the distribution of cars.

Bessemer Coke Company—This company has let a contract for the building of 200 coke ovens at Millsboro, in Washington county, on the Monongahela river. The coal tract at that point is to be further developed and an additional mine opened. The new ovens will replace those at the Martin works, recently sold to the Republic Iron and Steel Company.

Emerald Coal Company—This company —of which Julian Kennedy, of Pittsburg, is president — has bought from J. V. Thompson, of Uniontown, a tract of 4200 acres in Greene county, the price paid being $220 per acre. The whole transaction involved $1,176,000. In securing this **latest tract the Emerald company rounds** out its Greene county holdings, as the tract lies between its two former purchases. The total acreage purchased by this company from Mr. Thompson in the three transactions reaches 9400 acres.

South Dakota

Custer County

Hartwell—Over 300 ft. has been driven toward the footwall in the tunnel and 55 ft. more will be driven before the main ledge is reached. The vein contains high-grade gold ore and is 40 ft. wide.

Lawrence County

Gilt-Edge-Maid—Superintendent L. A. McCandless has resigned to devote his time to some Wyoming properties. A directors' meeting has been called for Dec. 30, to consider increasing the capital stock from 1,000,000 to 1,500,000 shares and issuing bonds for $300,000 to cover improvements. R. N. Ogden, of Deadwood, is manager of the property.

Homestake South Extension—Superintendent A. H. Oleson, of Deadwood, is about to continue sinking the shaft another 100 ft., making the total depth 300 ft. The mine now shows 2500 ft. of workings; the ore averages $3.50 per ton gold.

Pennington County

Keystone - Holy Terror — President Frank Gray, of New York, was here and made arrangements for starting up during the month. The Holy Terror will be unwatered and a drift on the 400-ft. level run to the Keystone and ore taken from both mines to the 20-stamp mill. The cyanide annex will be completed.

Tennessee

Franco-American Phosphate Company—The *Manufacturers' Record* reports that this company, which has a capital of $7,500,000, takes over 16,375 acres of phosphate lands in Maury, Hickman and Perry counties, most of this being on the Swan Creek Railroad, just completed. About 10,000 additional acres are under option, and the company will soon begin the erection of plants and the development of the lands. The company is chartered under Arizona laws, and has filed its charter in Tennessee and France. Of the $7,500,000 stock, $5,000,000 will be used for purchasing the lands in Tennessee and $2,500,000 for European plants and working capital. Most of the capital will be furnished by fertilizer manufacturers and bankers of Europe. Wm. G. Daugherty is president of the company, and the offices are at 603 Keyser building, Baltimore.

Washington

Terry County

Belcher Mountain Mining Company—This month it will begin work at its property on Belcher mountain for the financial difficulties have been settled. Money for carrying on the work will be advanced by Winnipeg stockholders.

Lucile Dreyfus—Shipments from this mine at Danville have ceased; two shifts of men are sinking the shaft to a depth of 450 ft. where a crosscut will be run to catch the vein. The property is owned principally by William R. Ridpath, of Spokane, who is also manager for the company.

Laurier—Six men are driving a crosscut adit at this mine near Laurier, owned by W. D. Greenough. The vein contains copper.

Manila—This mine is sending 30 tons of ore a day to Keller where it is being stored in the bins of the Keller & Indiana Smelting Company's plant, awaiting the blowing-in which will take place either this month or early in December. Over 1200 tons of ore are now in the bins.

Stevens County

Germania Mining Company—A controlling interest in the Roselle Mining Company owned by Spokane people has been bought by the Germania Mining Company, composed principally of Germans, for a sum slightly exceeding 50,000. This settles a long standing dispute between the two companies regarding the ownership of about 320 acres of land, first located by the Roselle company. The property contains a valuable vein of wolframite; some of this ore has been tested in Germany and used in making tungsten steel for ordnance. William Scheck, of Spokane, is manager for the Germania company. Work on the disputed ground will probably be resumed shortly, as the company has expended $75,000 in development; the orebody has been opened by several adits.

Blue Jim Mining Company—This company has begun to develop its group of five claims on the Pend d'Oreille river. At surface good copper ore has been found.

West Virginia

Taylor County

Pittsvein Coal Company—This company, at Flemington, is erecting a new tipple and retarding conveyer, made by the Fairmont Machinery Company. The company owns about 1200 acres of coal lands, and its plant when completed will have a capacity of 1500 tons daily. John Delaney is manager.

Wisconsin

Zinc-lead District

Benton—The Corr mill equipment was completely destroyed by fire Nov. 13; the plant consisted of a single jig mill, with Wilfley table, and power house; a separate pumping plant was saved. The Corr is a dividend payer and one of the heaviest lead producers in the district; the plant will be rebuilt. The office of the company is at Beloit, Wis.; E. D. Bullock is secretary.

Beloit-Elmo—This company will build a mill on its property three miles west of Elmo. The shaft is down 100 ft. and reveals 3 ft. of jack disseminated through a loose clay and sand which separates very freely. Beloit and Benton men comprise the company, with office at Beloit, Wis.

Bureau Mining Company — The mill equipment moved by this company to the Rooney-Swift mine, will begin operations soon, with gasolene power.

Fox—This company has purchased the roaster equipment at the Wicklow mine and will remove the same to its property at Strawbridge, four miles south of Benton. The Fox is a big low-grade producer and for the past three months has been roasting at the Enterprise plant at Platteville.

Dawson—This mine, which was closed down a short time ago, has been reopened.

Platteville—C. D. Harding, who recently reopened the Graham-Stevens mine, is developing new sheet ground in a forehead 8 ft. high and 75 ft. wide; up to this time the jack has been all disseminated.

Wisconsin Zinc Company — (Correction.) By omitting the side head to news item in the Journal of Oct. 31, a dividend

of 3 per cent. on $75,000 capitalization declared by the St. Rose Mining Company, read as though credited to the Wisconsin Zinc Company.

Wyoming

CARBON COUNTY

West Virginia-Wyoming—In this mine near Encampment a body of sulphide copper ore is said to have been found, apparently of considerable size. J. W. Buckley is superintendent.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Nov. 14 were as follows: Chambers-Ferland, 60,000 lb.; City of Cobalt, 61,700; Kerr Lake, 61,400; La Rose, 395,500; Nipissing, 293,740; O'Brien, 255,180; Temiskaming & Hudson Bay, 60,000; total, 1,187,520 pounds.

Buffalo—The management is at present recovering between 80 and 84 per cent. of the silver on the concentrating tables. With the instalment of the cyanide plant, which is expected to be in operation about the first of the year, it is hoped to increase the recovery to 95 per cent. Drifting on vein No. 12, at the 175-ft. level discloses ore richer than that obtained on the same vein at the 80-ft. level.

Chambers-Ferland—A vein 2 in. wide, carrying about 3000 oz. silver per ton, has been struck at the 80-ft. level of No. 2 shaft. Contracts have been made with the Right of Way company to raise from the La Rose vein on the Chambers-Ferland to the surface.

Crown Reserve—Royalties to the Ontario Government for the quarter ending Oct. 31 amounted to $10,257. From the main working shaft at the 100-ft. level drifting is being pushed east and west, blocking out large quantities of high-grade ore. The original shaft is down nearly 130 ft. and will be sunk 70 ft. lower, where drifting to the east will be started. Crosscutting is being continued north to intercept rich veins located by diamond drilling.

Coniagas—The mill of this company is being increased to 30 stamps, which will give it a capacity of 120 tons per day.

Trethewey—The directors have decided to make a 10-per cent. distribution of profits on Dec. 15. The company, instead of declaring dividends at stated intervals, will disburse profits whenever a sufficient surplus accumulates.

King Edward—A new smaltite vein nearly 2 ft. wide has been discovered on the surface.

Magee Location—This property, just north of the Violet, is being developed for Montreal capitalists by Chas. O'Connell with a force of 25 men. A diamond drill is in operation.

Nipissing—Several new finds have been made recently. At the 140-ft. level on the Kendall vein, 305 ft. east in the drift, a series of cross-veins has been encountered, the largest of which is 5 in. in width carrying rich ore. The rock between these veins is heavily shot with silver. Vein No. 49, at the 105-ft. level, has widened to 18 in. and carries 5000 oz. silver to the ton.

Nova Scotia—A rich strike of native silver has been made in the big 8-ft. orebody in the lower level.

Silver Bar—Operations are to be resumed at this mine, which has been idle for some time owing to financial difficulties. A syndicate of Toronto and Cobalt capitalists has secured a controlling interest. Some good ore has been taken from the shaft at a depth of 80 ft., and another promising vein has been found at the surface.

Station Grounds—On this property a good strike has been made. A vein between 5 and 6 ft. wide is said to have been found on the surface showing cobalt bloom. It apparently runs into the Cobalt Lake and Nipissing properties.

Temiskaming—In drifting on the Gans vein, at a depth of 200 ft., a rich native silver vein 7 in. wide has been encountered.

ONTARIO—MONTREAL RIVER DISTRICT

Marcel Mines Company—Work is being done at this property in James township, under the direction of J. W. Moffatt, consulting engineer. Fifteen veins have been traced and several prospecting shafts will be sunk.

ONTARIO—RAINY LAKE GOLD DISTRICT

Several important discoveries have recently been made. At Dyment, Thomas Hogan found a reef of ore, samples from which are stated to assay $3124 to the ton. A number of stamp mills are being erected in the district.

NOVA SCOTIA

Dominion Coal Company—Shipments of coal up the St. Lawrence have closed for the season; the total for the year was 1,345,000 tons, an increase of about 225,000 tons over 1907.

Mexico

CHIHUAHUA

Mineral Production—The mineral output of Chihuahua for the year 1907 amounted to 21,854,309 pesos, according to recently published semi-official statistics. The bulk of this total came from mines in the Santa Eulalia, Parral, Naica and Sierra Madre districts.

Rio Plata—The statement of October operations contains the following items: Production of the month, 62,764 oz. silver, giving net returns of $46,335.12; operating expenses, $13,901; paid account indebtedness on mine, $32,435, leaving a balance of $138,240 due on mine Nov. 1; average value of concentrates shipped during first ten months of year, 1413 oz. silver to the ton.

Hearst Oil Concessions—It is reported that W. R. Hearst and associates will shortly resume oil-drilling operations on their tract in eastern Chihuahua. The exploitation work to date is said to have been encouraging and additional lands are being acquired under concession.

Bullion Shipments—Recent bullion shipments from the Sierra Madre section include the following: Republic, 26 bars; Candemêna, 12 bars; A. Seyfert, 6 bars and Rascon Bros., 3 bars.

La Fortuna—This old silver mine in the vicinity of Nueva Casas Grandes along the line of Rio Grande, Sierra Madre & Pacific railroad in the northern part of the State is reported under profitable operation by La Fortuna Mining Company. A force of 60 men is employed under the direction of L. D. McBane.

Monclova-Chihuahua Railway—Recent reports indicate the probability of the consummation of this project which will benefit localities of known mineral deposits in this State as well as in Coahuila. The promoters have been given substantial encouragement financially. As projected, the eastern terminus will be Monclova, Coahuila, on the International line and the western at Chihuahua.

San Francisco del Oro—It is announced at Parral that this company is shortly to begin building a railroad from Molina station on the Parral & Durango road to its operating mines.

Parral Output—The production of the Parral camp for the week ending Nov. 13 was 9100 tons, of which 5450 tons were locally treated. The October output totaled 42,320 tons.

GUANAJUATO

Bullion shipments for the week ending Nov. 21 showed a slight increase, amounting to $91,500. The ore and concentrate shipments were valued at $57,000, same as last week. Total for the week, $148,500.

JALISCO

The completion of the railway to Colima makes it possible to go directly from Mexico City to the Pacific coast at Manzanillo via Guadalajara. This is the second transcontinental connection to be made recently, the other being farther south, at Tehuantepec. There are now 12 lines of steamers which touch at the two ports, Puerto Mexico and Salina Cruz.

San Pedro Analco—This company operating near Hostotipaquillo is adding to its present hydraulic power plant on the Santiago river and is also designing a cyanide mill and plant for treating its own and custom ores. The office of the company is in Guadalajara.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 25—Coal trade in the West seems to be about the same as last reported. There is still some congestion at important centers, owing to large shipments from mines. The Lake trade is closing without any great rush. Steam trade increases slowly, the gain being too small to make any marked difference from week to week. Our recent estimate of a decrease of 20 to 25 per cent. this year in bituminous-coal production seems to be generally accepted as approximately the fact. In the East the bituminous trade shows more activity, especially on the Seaboard and in New England territory, where winter stocks have to be considered.

Anthracite trade is quiet, in view of the continued mild weather. The demand for steam sizes of anthracite continues to be moderate.

The question of liability for damages resulting from discrimination in the distribution of empty cars is to be tested in two suits just begun by coal operators against the Pennsylvania Railroad Company.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 14, in short tons:

	1907.	1908.	Changes.
Anthracite.....	4,957,237	4,493,592	D. 463,645
Bituminous.....	34,673,915	29,335,198	D. 5,338,717
Coke.....	12,223,789	6,125,180	D. 6,098,609
Total.....	51,854,941	39,953,970	D. 11,900,971

The total decrease this year to date was 23 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, nine months ended Sept. 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	16,336,967	2,135,595	18,472,562
Buff., Roch. & Pitts.	3,974,772	245,953	4,220,725
Buff. & Susqueh'na	812,999	134,312	947,311
Penn. lines, N. Y. C.	4,783,879	52,060	4,835,939
Pitts. & L. Erie.....	5,866,360	2,121,154	7,987,514
Norfolk & Western.	8,056,080	1,384,569	9,440,649
Total.....	39,831,057	6,073,643	45,904,700
Total, 1907.....	49,297,747	10,968,080	60,265,827

Total decrease, 14,361,127 tons, 23.7 per cent. In addition the Baltimore & Ohio carried 713,774 tons anthracite in 1907, and 546,959 in 1908; decrease, 166,815 tons.

Coal receipts at St. Louis, nine months ended Sept. 30 were 5,695,571 short tons in 1907, and 4,831,849 in 1908; decrease, 863,722 tons.

Coal shipments by water from Seattle and Tacoma, Wash., nine months ended Sept. 30, were 542,694 tons in 1907, and 401,094 in 1908; decrease, 141,600 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, nine months ended Sept. 30, short tons:

	1907.	1908.	Changes.
Hocking Valley.	2,975,528	2,269,619	D. 705,909
Toledo & Ohio Cent.	1,348,064	1,094,889	D. 253,175
Baltimore & Ohio....	1,686,756	1,038,983	D. 647,773
Wheeling & L. Erie .	2,560,135	1,987,683	D. 572,452
Cleve., Lorain & Wh.	2,161,213	1,770,575	D. 390,638
Zanesville & Western	1,200,012	882,790	D. 317,222
Toledo Div., Pen. Co.	1,707,145	1,130,538	D. 576,607
L. Erie, Alliance & Wh.	919,551	734,953	D. 184,598
Marietta, Col. & Clev.	22,816	33,763	I. 10,947
Total.....	14,581,220	10,943,793	D. 3,637,427

The total decrease this year was 24.9 per cent.

Coastwise shipments of coal from chief Atlantic ports, nine months ended Sept. 30, long tons:

	Anthracite.	Bitum.	Total.	Per Ct.
New York....	11,019,258	7,419,656	18,438,914	62.2
Philadelphia	1,555,961	3,448,584	5,004,545	16.9
Baltimore....	179,273	2,751,746	2,931,019	9.9
Newp't News	.....	2,032,912	2,032,912	6.8
Norfolk.....	.. ..	1,249,309	1,249,309	4.2
Total.....	12,754,492	16,902,207	29,656,699	100.0
Total, 1907.	14,167,426	18,141,460	32,308,886	.....

Total decrease this year, 2,652,187 tons, or 8.2 per cent. New York includes all the New York harbor shipping ports.

New York

Anthracite

Nov. 25—The hard-coal market is dull, and largely dependent upon the weather. Both prepared and small steam sizes are plentiful, and the demand is only moderate. It is stated that the larger anthracite mines will close down on Thanksgiving Day and will not reopen until the following Monday.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The soft-coal market is variable. One day orders are fairly plentiful and the next day there is no demand. On the whole there is a slight improvement, especially when compared with a month ago. New York harbor continues dull, and good grades of steam coal fetch $2.45@2.65 per ton. No trouble is experienced with either transportation or car supply.

In the Coastwise vessel trade boats over 1500 tons capacity are plentiful, but smaller craft are scarce. Freight rates are firm and unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, $1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Nov. 23—Coal operations in Alabama show steadiness and the production is finding a ready demand right along. There is still room for improvement, however. A fire in mine No. 3, of the Tennessee Coal, Iron & Railroad Company, worked exclusively by convicts, caused the death of eight convicts the past week. The mines were out of commission for a couple of days. The Margaret mines were also out of commission for a few days the past week because of a fire on the face of the coal. Coal prices in Alabama show no change. There is still considerable labor waiting the opportunity to pick up tools. Coke is in good demand and the quotations are strong.

Chicago

Nov. 23—The coal market, for both steam and domestic supplies and sales, has improved in the last week, though still far from being satisfactory to most dealers. Supplies of the coals most subjected to demurrage sales have been restricted, and the demand has quickened perceptibly. Much coal from Illinois mines, however, is still sold at 10 or 25c. less than the average market price, to escape demurrage charges, and smokeless run-of-mine has the same trouble of over-consignments. With the mild weather the demand for domestic supplies has slackened; this demand increased under the cold spell that ended in the middle of the week. Sales for steam supplies are increasing with the general betterment of business, but the receipts of steam coals are so large that prices cannot advance.

Lump and egg from Illinois and Indiana mines bring $1.65@2.65; run-of-mine $1.65@1.75 and screenings 95c.@$1.65, car prices. Coals from east of Indiana find in general good demand, Hocking especially, with sales increasing and shipments not too heavy for firmness of prices. Smokeless producers are holding back run-of-mine with the result that more coal is sold at circular prices or near thereto. Smokeless lump and egg are strong, bringing $4.05@4.20, with run-of-mine at $2.85@3.30, sales made to escape demurrage showing 15@25c. less. Youghiogheny is steady at $3.15 for ¾-in. gas on contracts, and Pittsburg No. 8 weak at $2.65@2.85 for the same size.

The anthracite market shows more

steadiness with sales fairly good and well distributed, nut coal being somewhat scarce. Retail dealers are not heavily supplied, in general.

Indianapolis

The coal industry in Indiana up to date has shown a falling off at least 25 per cent. when compared with the same period last year. The operators in Southern Indiana have lost a portion of their trade with river towns south of Evansville because of low water, and because of the continued dry and warm weather the Northwestern trade has been much more tardy and sluggish than usual. During the past week Lake trade orders began coming in and the Indiana miners worked more days than at any time since last March. Prices remain the same except a slight increase for steam coal, the demand for which has materially increased since the election.

Indiana is waking up to the necessity of conserving its natural resources and a movement has been started to improve and develop the water ways of the State. By such improvement lower rates on coal can be secured and impetus given to many industries.

The officials of the Indiana District of the United Mine Workers, in pursuance of the agreement with the operators, have selected Thomas Haggerty National board member from Pennsylvania, to act with Harry Moore of the Indiana operators' executive board to arbitrate and settle the Hudson mine strike. Under the agreement the decision of the two is to be final.

Pittsburg

Nov. 24—A falling off in production is noted this week, not more than 50 per cent. of the railroad mines being in operation. The decline is due to a suspension of shipping to Lake ports. Prices remain firm on the basis of $1.15 for mine-run coal at mine, but small producers are shading this for prompt shipment. Slack is 60@75c. The river mines continue idle, and there are no signs of a rise in the rivers. Stocks loaded and ready for shipment as soon as the rivers are navigable are the largest for many years.

Connellsville Coke—Conditions in the coke trade continue about the same as a week ago. The thousands of men who went to their homes in foreign countries when the depression began last fall are not returning as rapidly as desired. Of the 38,000 ovens in the Connellsville regions, not more than 18,000 are on the active list. This indicates that fully 20,000 men are absent. One independent concern this week was unable to fill a contract on account of a scarcity of men. Prices remain firm at $2 for furnace and $2.25 for foundry for contracts covering the first half. For prompt shipments the price for furnace coke may be shaded. The *Courier* gives the production in both fields at 228,190 tons. The shipments amounted to 7984 cars as follows: To Pittsburg district, 3036; to points west of Pittsburg, 4365; to points east of Connellsville, 583 cars.

Foreign Coal Trade

United States Exports—Exports of coal from the United States, nine months ended Sept. 30—heretofore reported—with the addition of coal furnished to steamships in foreign trade, long tons:

	1907.	1908.	Changes.
Exported	9,819,143	8,629,683	D. 1,189,460
Steamship coal	4,223,554	4,470,384	I. 246,830
Total	14,042,697	13,100,067	D. 942,630

Total decrease this year was 6.7 per cent.

Nova Scotia Coal Shipments—Shipments by companies from Nova Scotia mines, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Dominion	2,716,936	2,815,546	I. 98,610
Novo Scotia Steel	518,742	545,305	I. 26,563
Cumberland	213,409	305,516	I. 92,107
Acadia	262,230	265,389	I. 3,159
Inverness	198,847	218,236	I. 19,389
Intercolonial	222,547	210,296	D. 12,251
Total	4,132,711	4,360,288	I. 227,577

All the companies but one show increases. Total gain this year, 5.5 per cent.

British Coal Trade—Coal exports of Great Britain, with coal furnished to steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Coal	52,814,549	52,423,508	D. 391,041
Coke	768,415	958,102	I. 189,687
Briquets	1,233,226	1,244,869	I. 11,643
Total exports	54,816,190	54,626,479	D. 189,711
Steamer coal	15,539,691	16,218,324	I. 678,633
Total	70,355,881	70,844,803	I. 488,922

The larger exports this year were 8,725,923 tons to France, 8,222,943 to Germany, 7,265,680 to Italy and 3,568,928 tons to Sweden.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 14: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.80; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 25—The sensation of the week has been found in Andrew Carnegie's article published in the *Century Magazine,* in which he claims that duties on iron and steel are no longer needed to protect manufacturers in this country from foreign competition. The matter has been taken so seriously that a conference of iron and steel men has been held in New York and a delegation named to appear before the Ways and Means Committee in Washington. Undoubtedly Mr. Carnegie's views will have much influence on public opinion, in view of the present agitation for tariff revision.

Business in pig iron has been less active so far as foundry iron is concerned, but there have been considerable transactions in basic pig. The foundry demand seems to be largely satisfied for the present, but steel makers are looking forward to more active business. In finished material the market has been rather quiet. Structural steel is still the leader, but the contracts closed have not been large.

There is a report current that the Louisville & Nashville Railroad Company is seeking to place an order for 65,000 tons of open-hearth steel rails, and being dissatisfied with terms offered, has asked bids from some foreign makers for the rails delivered at Pensacola, Fla. It is not possible to confirm this rumor at present.

A conference of steel men, under the auspices of the United States Steel Corporation, has been called, to be held in New York, Dec. 10. It is probable that there will be a general consideration of the price question.

Lake Superior Corporation—The large block of stocks and bonds for some time past held in Philadelphia, chiefly as collateral for loans to the Canadian Improvement Company, has been sold to a syndicate, said to be composed of New York and Canadian capitalists. It has been reported that the deal was in the interest of the United States Steel Corporation, but this is not at all certain.

Birmingham

Nov. 23—An intimation of an advance in quotations for pig iron has been sounded in the Southern territory already, an order for 200 tons of gray-forge iron having been booked by one of the smaller companies during the past week at $11.75 per ton. The iron is to go to the Eastern territory. All manufacturers who are in a position to take on more business for delivery during the first quarter of the coming year are finding no difficulty in disposing of their product. While it is still announced that $13 per ton, No. 2 foundry, is the average quotation for the product in this district, some of the furnace companies are asking a better price.

The big steel plant of the Tennessee company will at the turn of the coming year not only have more men employed, but will start on double turn. The cast-iron pipe makers are landing orders right along and already have reason for steady operation of plants.

Chicago

Nov. 23—The iron market continues to gain strength, but without any startling features. Users of pig iron are generally

increasing their purchases, yet limiting tonnage to their needs for the first quarter or first half of next year. The customary reluctance to crossing the imaginary line of the new year is not manifest; confidence exists in the future. It is only a question with the average buyer now how far he can go without running too far ahead of general business recovery. Not only is the aggregate tonnage of sales now increasing, but the increase is caused by an enlargement of the average order. Hand-to-mouth buying is disappearing.

Southern No. 2 foundry holds to $13 Birmingham ($17.35 Chicago), with perhaps a few sales made at slightly less, but with more in which $13.50 Birmingham is asked and obtained. Northern No. 2 finds its low point at $17, with a range of 50c. higher. Lake Superior charcoal is firm at $19.50@20. These prices are for the first and second quarters, with the concession made to delivery within the next 30 to 60 days practically out of existence.

Iron and steel products show increasing strength, with structural materials and railroad supplies in heavy prospective demand, to judge from inquiries, and a fair amount of buying almost everywhere. Coke is active and slightly higher in price, the best Connellsville commanding $5, with 25c. more said to be obtained on some contracts.

Philadelphia

Nov. 25—The pig-iron market is quieter. Sales of foundry are slower, but basic is doing well. Forge is picking up a bit. Sales run into the first quarter of 1909, but furnaces are beginning to hold back on second-quarter orders at current prices. No. 2X may be quoted at $17@17.50; basic around $16.25; forge at $15.50. Not much Alabama iron is offered, but Virginia pig is in evidence.

Bars—Retail business is picking up. An advance of $2 per ton on iron bars is reported from Pittsburg, putting them higher than steel bars.

Sheets—Store business is better, and small orders are coming to mill; but no big ones.

Plates—Car building and other work requiring plates are looking up. There is a better demand, and mills are filling up gradually.

Steel Billets—Inquiries are better, especially for forging billets.

Structural Steel—An increased demand for moderate sized lots for bridge and building work is the feature. Some large orders are held upon the price question.

Scrap—Dealers are raking in scrap, in anticipation of higher prices. They are feeling better than for some time, and will not sell except at their own figures. There is talk of $16.50@17 for heavy-steel melting; $19@20 for No. 1 railroad, and $15@15.50 for good cast scrap.

Pittsburg

Nov. 24—While there has been no decided improvement in conditions in the iron and steel trade compared with last week, the tone is much better and the outlook is considerably brighter. In finished-steel lines small orders are being booked, and production shows slight gains. It is reported, but not officially confirmed, that a new, long-term contract has been made by the American Sheet and Tin Plate Company with the American Can Company. It is said the Can company will take fully 65 per cent. of the tinplate production, but this is regarded as entirely too high. The tinplate company is operating its tinplate and sheet mills at about 55 per cent. of capacity. The large steel companies—Carnegie, Republic, Jones & Laughlin, National Tube and American Steel and Wire—are operating to nearly 65 per cent. of capacity. The Republic will put its bessemer-steel plant at Youngstown in operation on Monday. New business taken by the Jones & Laughlin Steel Company includes plates and shapes for the new ore boat to be built by Great Lakes Engineering Company for the Shenango Steamship Company, one of the W. P. Snyder interests. About 7000 tons of steel will be required. The Pressed Steel Car Company is figuring on about 6000 steel cars, which will mean a contract with the Carnegie company for upward of 60,000 tons of plates. The Carnegie company has taken orders for 5000 tons standard steel rails and about 3000 tons of light rails. It also has booked an order for 2000 steel wheels which will be turned out at its plant at McKees Rocks, Pittsburg.

Pig Iron—The market is not as active as a week ago, although there have been some good sales at higher prices. Quotations continue to be made at the figures given a week ago, and in some cases at the maximum. One producer is naming $16, Valley furnaces, as the minimum for standard bessemer, malleable bessemer, No. 2 foundry and basic, for prompt and first-quarter delivery. Sales made during the week have been at lower prices. The Standard Sanitary Manufacturing Company has bought in the past three weeks 10,000 tons for the New Brighton and Allegheny plants, covering requirements up to July 1, 1909. The company has not covered for its plant at Louisville, where only Southern iron is used. The Westinghouse Electric and Manufacturing Company closed for 3000 tons of Nos. 1, 2 and 3 foundry. The price is said to have been $15.50 for No. 2. The iron is for second-quarter delivery. Small sales of bessemer for prompt shipment were made at $15.75; malleable bessemer at $15.50; basic at $15.25; No. 2 foundry at $15.50@15.75, and gray forge at $14.25, all f.o.b. Valley furnaces.

Steel—There is but little doing in billets at $25, Pittsburg, the regular quotations. Sheet-bars remain at $27.50, steel bars at 1.40c., and plates at 1.60c. Iron bars have been advanced to $2 per ton above steel bars, being 1.50c. Pittsburg.

Sheets—There is a slight improvement in sheets, and recent shading has been stopped. Black sheets are quoted at 2.50c.; galvanized at 3.55c. for No. 28 gage.

Ferro-manganese—The market is strong; prices for prompt and first-quarter are $47@48, with indications of an advance.

Foreign Iron Trade

Russian Iron Ore Exports—Exports of iron ore from Russia have shown a remarkable gain, rising from 28,884,000 poods (464,200 long tons) in 1906, to 54,905,000 poods (882,400 tons) in 1907; an increase of 90.9 per cent. A large part of these exports are to Germany.

Blast Furnaces in Great Britain—On Sept. 30 there were reported in Great Britain 301 furnaces active and 214 out of blast. The average number of furnaces in blast for the quarter ended Sept. 30 was 298, or 15 less than in the June quarter.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 25.

At all U. S. Ports in October and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1908..	$ 1,952,574	$ 3,782,705	Imp. $ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,087,919	" 14,936,871

Exports of specie from New York week ended Nov. 25: Gold, $859,727, to Panama and West Indies; silver, $603,250, to London and Paris. Imports: Gold, $280,043, chiefly from Cuba; silver, $105,495, from the West Indies and South America.

Gold—Bar gold is quoted on the London open market at 77s. 11¼d. per ounce, a decline of ⅜d. from last week. American gold eagles are 76s. 6¼d. Foreign exchange is higher in New York, approaching the gold export point. Some gold has gone to Canada.

Foreign commerce of the United States 10 months ended Oct. 31, as reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports	$1,511,841,992	$1,402,768,153
Imports	1,219,984,920	900,658,289
Excess, exports	$ 291,857,072	$ 502,109,864
Add excess of exports, silver		8,622,528
Add excess of exports, gold		28,679,276
Total export balance		$ 539,411,668

The gold and silver movement in detail is given in the table at the head of this column.

Platinum—The market is inclined to be higher. Some small lots of scrap sold this week at $21; dealers are quoting $24 for ordinary refined, $26.50 for hard, and $19 for scrap. This represents, of course, the ordinary business, which is more or less of a retail character. It is reported that large consumers are still able to buy on a basis of $18 for ingot.

Silver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
19	4.8600	49⅞	23 1/16	23	4.8645	49⅝	22 15/16
20	4.8630	49⅞	23 1/16	24	4.8650	49¼	22¾
21	4.8625	49⅞	23 1/16	25	4.8650	49¼	22¾

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver—The market still shows a slight declining tendency. The bear account in London, we understand, still remains uncovered. Without active purchases on a larger scale than has been obtaining, no advance is to be expected.

The Mexican Financial Agency in London announces that the Mexican Monetary Commission will accept offers of 5000 kg. weekly of silver for coinage; this amount may be increased in future.

Shipments of silver from London to the East, year to Nov. 12, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India.....	£10,133,904	£8,250,623	D. £1,883,281
China.....	217,350	516,400	I. 299,050
Straits.....	645,950	164,885	D. 481,065
Total.....	£10,997,204	£8,931,908	D. £2,065,296

Exports for the week, £42,000 to India. Imports, £10,000 from New Zealand, £6000 from Mexico, £144,000 from New York; £160,000 in all.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
19	14⅜ @14½	14 @14¼	62⅞	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
20	14⅜ @14½	14 @14¼	63⅛	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
21	14⅜ @14½	14 @14⅜	....	30⅜	4.30 @4.32½	5.10 @5.12½	4.95 @4.97½
23	14⅜ @14⅝	14 @14⅜	62⅝	30	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½
24	14¼ @14⅜	14 @14⅜	62⅝	30	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½
25	14⅛ @14⅜	14 @14⅜	64	30⅛	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Nov. 18 the market has continued dull and has been dominated by the offers from and transactions effected by the weaker speculative interests. The market has been followed downward by certain first hands, but in general the producers have made no concessions from their prices previously asked, which they expect will soon be realized. The setback in the market has, moreover, been stayed by bids from consumers at a shade less than is the price quoted. Consequently, although the market has appeared weaker, some speculative lots having been sold sporadically as low as 13⅞c. for electrolytic and 14⅛c. for Lake, there is felt to be a strong undercurrent in the general situation and an early recovery is confidentially expected, which may go higher than the last previous rise, but the idea of a runaway market is discouraged among the more conservative interests. On the comparatively small business of Nov. 18-25 prices have been rather irregular. At the close Lake copper is quoted at 14¼@14⅜c.; electrolytic in ingots, cakes and wire bars at 14@14⅛c. The average for casting copper has been 13¾@13⅞ cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

An important feature in the copper market recently has been the increased participation of bold speculative interests in New York. These have operated chiefly in Standard copper in London, commitments to the extent of 1000 tons having been entered into in some cases. There have also been some speculative transactions in refined copper on this side, but these have been discouraged by the selling agencies and have been permitted only in special cases when blunt refusals might have been impolitic. The present large speculative ventures are viewed with apprehension among the selling agencies, which aim to deal only with manufacturers, inasmuch as they may be an unusually disturbing factor should the market fail to make a further advance in the near future. As is well known, there is a close relation between the prices for Standard in London and refined in New York.

During most of the week the London market for Standard copper fluctuated uncertainly, but on Tuesday a good speculative demand again set in and the market advanced £1, closing strong at £64 for spot, £64 18s. 9d. for three months.

Refined and manufactured sorts we quote: English tough, £67 10s.; best selected, £66 10s.@£67 10s.; strong sheets, £78 10s.@£79 10s.

Exports of copper from New York and Philadelphia for the week were 4762 long tons. Our special correspondent states the exports from Baltimore at 1058 tons.

The office of L. Vogelstein & Co. has been removed from 100 Broadway to 42 Broadway, New York.

Tin—The London market evinced a rather firmish tendency throughout the week. While at one time prices showed a maximum decline of about £2, the turn was just as pronounced and the close is firm at £137 10s. for spot, £139 for three months.

The home market is a rather dull affair, owing to an entire absence of interest among consumers. Such transactions as are being consummated are of a retail character only. At the close the market is quoted at 30⅜ cents.

Exports of tin from the Straits, 10 months ended Sept. 30, were 45,503 long tons in 1907, and 49,608 in 1908; increase, 4105 tons.

Receipts of Bolivian tin in Europe in October included 61 tons of bars and 2691 tons concentrates; the equivalent metal being 1677 tons.

The output of the Federated Malay States, nine months ended Sept. 30 was 35,573 long tons tin in 1907, and 36,679 in 1908; increase, 1106 tons.

Lead—Buyers remained out of the market and little business has taken place. At the close, lead at New York is quoted at 4.27½@4.32½c., and 4.20@4.25c. at St. Louis.

The market abroad has declined further, Spanish lead being quoted at £13 8s. 9d., English lead £13 11s. 3d. per ton.

Spelter—Demand for this metal continues very good, and a large business has been done, both for prompt and future deliveries, at somewhat higher prices. At the close St. Louis is quoted 4.95@4.97½c., New York, 5.10@5.12½ cents.

The London market for spelter is a little higher, good ordinaries being quoted at £21 2s. 6d., with £21 7s. 6d. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Aluminum—Prices have been reduced again, and the Aluminum Company of America is now quoting 24c. base for No. 1 ingots; 33@34c. base for sheets. Foreign aluminum is offered at 22c. for ingots. The range is, therefore, 22@24c. per pound. Abroad, aluminum is still quoted at 13½ and 14 cents.

Antimony—The market is quiet, but a good feeling prevails. Prices are firmer abroad than in New York. Quotations are 8⅛@8¼c. for Cookson's, 8@8⅛c. for

Hallett's, and 7⅝@7¾c. for ordinary brands.

Quicksilver—The market is unchanged, with fair demand. New York price is $46 @47 per flask of 75 lb. San Francisco quotations are $44@45 for domestic orders, $42@43 for export. London, £8 10s. per flask, with 1s. 6d. less quoted by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, ten months ended Oct. 31, figures in long tons, except quicksilver, which is in pounds.

	Imports.	Exports.	Excess.	
Copper	143,576	57,150	Imp.	86,426
Copper, 1907	94,082	56,966	Imp.	37,117
Tin	39,211	33,764	Imp.	5,447
Tin, 1907	37,062	31,435	Imp.	5,627
Lead	198,884	42,733	Imp.	156,151
Lead, 1907	167,105	37,266	Imp.	129,839
Spelter	88,226	6,922	Imp.	81,304
Spelter, 1907	89,183	5,126	Imp.	84,057
Quicksilver, lb.	3,168,186	1,542,250	Imp.	1,625,936
Quicksilver, '07	2,939,796	2,061,470	Imp.	878,326
Ores:				
Tin ore and con.	21,724	.....	Imp.	21,724
Tin ore, 1907	17,918	.....	Imp.	17,918
Pyrites	652,241	.....	Imp.	652,241
Pyrites, 1907	644,200	.....	Imp.	644,200

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports this year the United States furnished 5820 tons copper matte, 51,217 tons fine copper and 31,080 tons lead.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 21—The $40-mark was reached this week as the highest price paid for zinc ore on a basis of $38@39 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $55 per ton was paid, one car of chunk lead bringing $56 per ton.

SHIPMENTS, WEEK ENDED NOV. 21.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	670,000	66,070	320,000
Cuba City	556,960	89,530	.....
Benton	549,800	53,860	.....
Days Siding	413,000	.....	.....
Strawbridge	317,000	.....	.....
Hazel Green	307,150	.....	.....
Galena	80,000	.....	.....
Total	2,893,910	209,460	320,000
Year to Nov. 21	98,924,552	9,562,915	4,164,604

Highland, Linden and Mineral Point are not reported, but this tonnage will be included next week. In addition to the above there was shipped to the Platteville Separating Company 436,150 lb.; to the Joplin Separator Works, 158,800 lb.; to the Enterprise roaster, 133,000 lb. zinc ore.

The higher price paid for zinc ore is effecting a revival of activity and increased production in the Platteville district. The average weekly shipment from the district of 2,400,000 lb. will be increased 40 per cent. within the next 30 days.

Joplin, Mo., Nov. 21—The highest price paid was $43, on an assay basis of $40. The base price ranged during the week from $38 to $42 per ton of 60 per cent. zinc, on sulphide concentrates. The higher base price was paid for concentrate carrying heavy iron contents, and is equivalent to dropping the penalty on 3 per cent., or under of iron. Zinc silicate sold on a base of $17.50 per ton of 40 per cent. zinc and the highest price was $24 per ton. The average price, all grades, was $35.62. The highest price of lead this week was $55 per ton, receding on Friday to $54 and on Saturday to $53. The average price, all grades, was $53.96 per ton.

Approximately 2000 tons of reserve stock were sold this week on a $40 base price, being divided among the several smelting companies. With a shipment of 6420 tons and an output of about 5600 tons it is seen that the stock was really reduced only 800 tons, permitting an accumulation of this week's output to take the place of the older stocks shipped.

SHIPMENTS, WEEK ENDED NOV. 21

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,411,830	405,940	$94,785
Joplin	2,361,230	435,870	58,482
Galena	924,110	76,380	19,618
Spurgeon	703,660	113,480	12,467
Miami	687,800	177,510	12,357
Prosperity	423,030	100,740	10,756
Duenweg	547,860	78,590	10,612
Granby	722,000	52,000	10,400
Aurora	458,240	.....	7,824
Alba-Neck	406,600	.....	7,725
Badger	313,160	24,750	6,921
Sarcoxie	240,730	.....	4,573
Carl Junction	175,780	.....	3,515
Carthage	149,130	.....	2,982
Quapaw	183,100	.....	2,746
Cave Springs	84,270	.....	1,600
Zincite	51,500	.....	1,030
Totals	12,844,080	1,465,260	$268,393
47 weeks	456,778,940	70,617,330	$9,647,716

Zinc value, the week, $228,820; 47 weeks, $7,703,793
Lead value, the week, 39,573; 47 weeks, 1,943,923

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	53.52	54.59
October	41.75	35.95	39.83	33.28	51.40	52.63
November	38.60	.....	35.19	.....	43.40	.....
December	31.50	.....	30.87	.....	37.71	.....
Year	$44.36	.....	$43.68	.....	$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Nov. 25—The improvement in the general trade is gradual, but steady.

Arsenic—The demand is small and confined to immediate requirements. Spot goods are offered at 3c. per lb. and up.

Copper Sulphate—The demand is fair, and prices are unchanged at $4.75 per 100 lb. for carloads and $5 for smaller lots.

Nitrate of Soda—The demand seems to be for immediate requirements, and little interest is taken in futures. Quotations are 2.15c. for spot and futures.

Mining Stocks

New York, Nov. 25—The general stock markets for most of the week were rather erratic in tone. Prices for several days were inclined to be weak, and stocks were absorbed slowly; the indications being that the public was inclined to leave the market to professional dealers. On Nov. 24, however, there was a sharp rally and advancing prices, with heavy trading. At the close there is a decided upward tendency.

On the Curb there was a similar course, business being rather dull and prices weak. There was some selling of copper stocks at a rather lower level. This was followed by activity and rising prices, with a good demand for stocks developing. The copper shares were leaders throughout in the volume of business.

Sales of Homestake, of South Dakota, were reported at $94@96.50 per share.

Boston, Nov. 24—Mining shares have been weak, but yesterday and today there was a recurrence of the late strength. Net changes for the week are trifling as a rule. Superior Copper has been conspicuous with a $6.62½ rise to $36.50. The majority of this company's 100,000 shares is in the treasury of the Calumet & Hecla Company and these people manage the mine. Early production is expected. Lake Copper spurted $2.25 to $18.75 and Franklin $2 to $18.25.

The declaration of a $5 dividend by Calumet & Hecla was not unexpected. The stock closed at $685, ex-dividend. Utah Consolidated slid off $1.50 to $45.50, but has recovered most of it. The late buying of this stock is said to have been by the Cole-Ryan-Thornton interests, which makes them a factor in this enterprise. The new smelter will save quite a considerable sum to this company. Amalgamated broke $4.75 to $82.25, but recovered to $85.50 today. Butte Coalition after touching $26.50 is back to $28 again.

Boston & Corbin ran off $1.25 to $22.25, but rallied to $24.75 today. The right to subscribe to the 10,000 shares of treasury stock at $25 expires tomorrow. Another dividend announcement has been made, that of the Utah Copper Company., 50c.

quarterly. Tennessee Copper broke over $5 to $45. North Butte ran off $2.75 to $85.25, recovering most of it, and Copper Range $2 to $79.50, rallying to $81.75. Isle Royale has risen $2 during the week to $25.

The annual meeting of the Shannon Copper Company was held last week and it developed that President Amster was the largest individual stockholder with 11,100 shares.

On the Curb National Mining and Exploration took a spurt from 70c. to $1.25; subsequently it ran back to 85c. Judge Loring has issued an injunction against the Boston Curb from trading on Doane street, but it does not become effective for 30 days.

San Francisco, Nov. 22—The Alta-Sonora Mining Company has succeeded in getting control of several claims in the immediate vicinity of their own and the famous O'Hara mine near Sonora, Tuolumne county. Rather an unusual step is to be taken by this company shortly; that is, listing its stock on the San Francisco Stock and Exchange Board. This is something seldom done with California gold properties. This will be the first of the Tuolumne county mines for some time which has taken this step. As a general thing miners are averse to stock transactions in their gold properties publicly on the stock boards. While hundreds of Nevada mining properties are listed there are not a half dozen California gold mines on the Board lists.

STOCK QUOTATIONS

NEW YORK Nov. 24		BOSTON Nov. 24	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	⅛	Adventure	8⅛
Amalgamated	85⅞	Allouez	40
Anaconda	51⅜	Am. Zinc	27
Balaklala	‡2 10/16	Arcadian	5
British Col. Cop.	8⅛	Arizona Com	38¾
Butte & London	....	Atlantic	18⅝
Butte Coalition	27⅞	Bingham	‡.30
Colonial Silver	⅛	Boston Con	16
Com. Ely Mining	8¼	Calumet & Ariz.	120½
Davis Daly	3 5/16	Calumet & Hecla	685
Dominion Cop.	1	Centennial	‡35½
Douglas Copper	3⅛	Con. Mercur	‡.33
El Rayo	4 1/16	Copper Range	82
Florence	4 3/16	Daly-West	10⅝
Foster Cobalt	.48	Franklin	18¼
Furnace Creek	.15	Greene—Con.	11½
Giroux	4⅝	Isle Royal	24⅞
Gold Hill	⅛	La Salle	14¼
Goldfield Con.	7	Mass	7
Granby	107	Michigan	14
Greene Gold	¼	Mohawk	70½
Greene G. & S	7	Nevada	19⅜
Greenw'r & D.Val.	‡.75	North Butte	87½
Guanajuato	2	Old Colony	‡.55
Guggen. Exp.	180	Old Dominion	58½
Hanapah	.15	Osceola	‡120
McKinley Dar.	1.02	Parrot	29
Micmac	2⅛	Quincy	96½
Mines Co. of Am.	1¼	Rhode Island	6
Mitchell Mining	⅜	Santa Fe	3
Mont. Sho. C.	1	Shannon	18¼
Nev. Utah M. & S	3½	Superior	36
Newhouse M. & S	6½	Tamarack	84
Nipissing Mines	10⅝	Trinity	17¾
Old Hundred	1 1/16	United Cop., com.	14¼
Silver Queen	1.08	U. S. Oil	‡29½
Stewart	⅝	U. S. Smg. & Ref.	46
Tennessee Cop'r.	44⅝	U.S.Sm. & Re.,pd.	46¾
Tri-Bullion	1	Utah Con	47¼
Union Copper	⅞	Victoria	4½
Utah Apex	5⅞	Winona	7
Utah Copper	48¼	Wolverine	152
Yukon Gold	4 7/16	Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	34⅞
Am. Smelt. & Ref.	85⅞
Am. Sm. & Ref. pf.	‡106½
Bethlehem Steel	24
Colo. Fuel & Iron	39
Federal M. & S., pf.	88½
Inter. Salt	15⅝
National Lead	84¼
National Lead, pf.	‡106¼
Pittsburg Coal	‡13⅛
Republic I. & S.	27¾
Republic I. & S., pf.	88
Sloss-Sheffield	80
Standard Oil	667
U. S. Red. & Ref.	‡13
U. S. Steel	56½
U. S. Steel, pf	112¾
Va. Car. Chem	42¾

BOSTON CURB	
Ahmeek	120
Black Mt	‡3⅞
East Butte	7½
Hancock Con	9⅛
Keweenaw	5⅛
Majestic	.74
Raven	.90
Shawmut	.10
Superior & Pitts.	‡14
Troy Man	‡.25

ST. LOUIS Nov. 21		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.05	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	70.00	68.00
C.C. & C. pd.	78.00	76.00
Cent. Oil.	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	19.00
Doe Run	130.00	115.00
Gra. Bimet.	.30	.25
St. Joe	16.00	14.00

LONDON Nov. 25	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 2 0
Camp Bird	0 17 6
Esperanza	3 3 0
Tomboy	1 0 0
El Oro	1 6 3
Oroville	0 8 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 25. Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick.	.12
Belcher	.28	St. Ives	.21
Best & Belcher	.44	Triangle	.04
Caledonia	.15	BULLFROG STOCKS	
Challar	.11	Bullfrog Mining	‡.03
Comstock	.31	Bullfrog Nat. B	‡.04
Con. Cal. & Va	.87	Gibraltar	.03
Crown Point	.40	Gold Bar	‡.03
Exchequer	.32	Homestake King	.14
Gould & Curry	.14	Montgomery Mt.	‡.05
Hale & Norcross	.42	Mont. Shoshone C	.95
Mexican	1.10	Original Bullfrog	‡.01
Ophir	1.90	Tramp Cons.	.13
Overman	.12	MANHAT'N STOCKS	
Potosi	.15	Manhattan Cons	‡.05
Savage	.40	Manhat'n Dexter	‡.03
Sierra Nevada	.33	Jumping Jack	‡.03
Union	.26	Stray Dog	‡.03
Utah	.03	MISCELLANEOUS	
Yellow Jacket	.47	Golden Boulder	‡.05
TONOPAH STOCKS		Bonnie Clare	.08
Belmont	.95	Lee Gold Grotto	..
Extension	.53	Nevada Hills	1.37½
Golden Anchor	.01	Nevada Smelting	1.00
Jim Butler	.17	Pittsburgh S. Pk.	.87
MacNamara	.46	Round Mt. Sphinx	.18
Midway	.25		
Montana	.73		
North Star	.06		
Tono'h Mine of N.	6.75		
West End Con	.43		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.20		
Booth	.29		
Columbia Mt	.16		
Comb. Frac	1.45		
Cracker Jack	.05		
Dia'dfield B. B. C.	.13		
Goldfield Belmont	.05		
Goldfield Daisy	.97		
Great Bend	.33		
Jumbo Extension	.28		
Katherine	...		
Kendall	.10		
Lone Star	.07		
May Queen	.06		
Oro	.13		
Red Hill	.22		
Roanoke	...		
Sandstorm	.20		

COLO. SPRINGS Nov. 21	
Name of Comp.	Clg.
Acacia	7½
Black Bell	....
C. C. Con	‡3¼
Dante	6
Doctor Jack Pot	7
Elkton	68
El Paso	47½
Findlay	17
Gold Dollar	8¼
Gold Sovereign	‡3½
Isabella	27
Index	....
Jennie Sample	5½
Jerry Johnson	3⅞
Mary McKinney	31¾
Pharmacist	3¼
Portland	1.03½
Un. Gold Mines	4
Vindicator	81
Work	‡8

Assessments

Company.	Delinq.	Sale.	Amt.
Amador, Ida	Nov. 20	Dec. 19	$0.02
American Fork, Utah.	Oct. 28	Nov. 25	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Columbus Ext., Utah	Nov. 13	Nov. 25	0.01
Con. Cal. & Va., Nev	Nov. 24	Dec. 15	0.20
Confidence, Nev.	Dec. 9	Dec. 30	0.20
Crown Point, Nev.	Nov. 17	Dec. 8	0.10
Ely Con., Nev.	Nov. 28	Jan. 11	0.02
Gould, Mont	Nov. 7	Dec. 7	0.05
Imlay, Utah	Nov. 11	Nov. 28	0.01
Liberty, Utah	Nov. 5	Dec. 2	0.03
Lucky Dutchman, Nev.	Nov. 21	Dec. 12	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
Overman, Nev	Dec. 2	Dec. 23	0.05
Penn. Con., Cal.	Nov. 2	Nov. 25	0.10
Seg. Belcher & Mides, Nev.	Nov. 7	Nov. 28	0.03
Silver King Con., Utah	Nov. 4	Nov. 25	0.05
Utah-United, Utah	Nov. 10	Nov. 27	0.01
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Zeibright, Cal.	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.576
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.726
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12,877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	.....	13.870	.....	61.226	.....
December	13.163	.....	13.393	.....	60.113	.....
Year	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	.....
June	42.120	28.024	December	27.925	.....
			Av. year.	38.160	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.551	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	.....	17.281	.....
December	3.658	.....	14.500	.....
Year	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	.....	4.775	.....	21.438	.....
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.